O'Connor

REPORT

on

A PLAN FOR RAPID TRANSIT IN SAN FRANCISCO CONSONANT WITH THE BAY AREA RAPID TRANSIT SYSTEM

May 1960

Prepared by the

Transportation Technical Committee

S.F. Mayor's Transportation Council

R E P O R T

on

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Prepared by the

T r a n s p o r t a t i o n T e c h n i c a l C o m m i t t e e

Report on a plan for rapid transit in San 1960.

THE TRANSPORTATION TECHNICAL COMMITTEE
OF THE MAYOR'S TRANSPORTATION COUNCIL

J. R. McCARTHY, Director of Planning, Chairman
R. H. OWENS, Director of Public Works
C. D. MILLER, Gen. Mgr. Municipal Railway
H. E. LLOYD, Chief Engin. Utilities Engin. Bureau
V. T. FISHER, Gen. Mgr. Parking Authority

May 19, 1960

100 Larkin St., San Francisco 2, Calif.

Honorable George Christopher, Mayor
Honorable Board of Supervisors
Mayor's Transportation Council

Gentlemen:

Submitted herewith is "A Plan for Rapid Transit in San Francisco Consonant with the Bay Area Rapid Transit System" which has been prepared under the direction of the Transportation Technical Committee of the Mayor's Transportation Council in accordance with a motion adopted by the Board of Supervisors on April 13, 1959, File No. 12476. The work was financed by funds provided in the amount of $125,000 by Resolution No. 263-59. A copy of each document appears in the appendix.

The report has been prepared by the Utilities Engineering Bureau under the direct supervision of its Chief Engineer with assistance from the staffs of the Department of City Planning, Municipal Railway, Department of Public Works, and the Parking Authority. The work of the Committee was supplemented by consultation with De Leuw, Cather and Company, which firm also furnished technical services of its personnel skilled in this specialized field.

The Committee acknowledges the cooperation and assistance of the staff members of the Bay Area Rapid Transit District.

The basic purpose of the study was to determine and plan for the optimum rapid transit service within San Francisco that would be consistent with the overall requirements of a regional system and to provide such service in accordance with standards which will preserve property and aesthetic values within the City.

We believe that the recommendations of this report meet this objective, and it is accordingly submitted for your consideration.

Respectfully submitted,

THE TRANSPORTATION TECHNICAL COMMITTEE

J. R. McCarthy, Chairman

Approved:

H. E. Lloyd

R. H. Owens

C. D. Miller

V. T. Fisher

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April 29, 1960

Transportation Technical Committee of the
Mayor's Transportation Council
City and County of San Francisco
100 Larkin Street
San Francisco, California

Gentlemen:

Pursuant to the agreement entered into on June 23, 1959, we have served as your consultants in the specialized fields involved in the transit study you have undertaken in coordination with the San Francisco Bay Area Rapid Transit District. This assignment has involved the preparation of preliminary plans, design and estimates of that portion of the District system within San Francisco as well as conclusions and recommendations pertaining to San Francisco's requirements in connection with the proposed San Francisco Bay Area Rapid Transit System, to insure the best interests of the people of San Francisco.

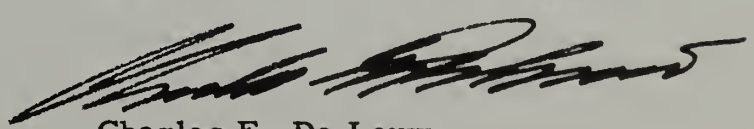
Services of members of our technical staff and data from our files have been furnished as required. Other principals of our firm and I have followed closely all of the work done by your committee and staff and we have reviewed your final report in detail.

This is to advise that we concur fully with the report, including the locations of the routes, the estimates of cost and traffic, as well as with the final recommendations.

May we take this occasion to express our appreciation to the committee and the members of its staff, and for the opportunity to have been of service on this important and constructive undertaking.

Yours very truly,

DE LEUW, CATHER & COMPANY



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Charles E. De Leuw

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SUMMARY

The Technical Committee recommends initial construction of 3 rapid transit subway routes within San Francisco to form an integral part of the San Francisco Bay Area Rapid Transit System, as follows:

1. A Twin Peaks line from Daly City, through the Twin Peaks tunnel and under Market Street to a terminal on Davis Street near Clay.
2. A Marin-Richmond line from the Golden Gate Bridge via Geary and Post Streets, to Market Street.
3. A Peninsula line entering the City on the Southern Pacific main line right-of-way and connecting to the proposed trans-bay tube from Oakland via Seventh, Leavenworth, Post and Market Streets.

The Committee recommends planning of a fourth subway route within the City, the construction of which can be deferred to a later date if necessary:

4. The Mission line, from an initial terminal on the proposed Southern Freeway at Ocean Avenue via Mission to Market Street and thence to the Davis Street terminal on the tracks of the Twin Peaks line.

Plate 1 shows the alignment of these 4 lines and the recommended location of stations along each. The Marin-Richmond and Peninsula subway between Second and Davis Streets will be located below the Market Street subway.

With the exception of the Peninsula route, which is primarily an inter-urban line, these routes are in close agreement with those recommended in previous rapid transit studies made by the City. For example, under one of the earliest, the 1936 report on Rapid Transit for San Francisco by Ridgeway and Brahdy, as well as under the most recent report of April 1950 prepared by the Department of City Planning, three similar radiating rapid transit routes were recommended - a Twin Peaks, a Geary Street and a Mission Street line.

The Committee has discussed routing of the rapid transit lines inside the City limits with engineers of the San Francisco Bay Area Rapid Transit District (which will hereafter be referred to as BARTD for brevity). As a result of those discussions, conducted in a spirit of cooperation and mutual understanding of the problems posed in amalgamating necessarily differing viewpoints, the BARTD engineers are conducting studies of the City's proposals. Tentative agreement appears to have been reached on routing of the Twin Peaks and the Richmond portion of the Marin-Richmond line. Routing of the Peninsula line is still under study.

Current planning of BARTD aims at 1969 as the first full year of operation of the area-wide rapid transit system. Accordingly the Committee has extrapolated all of its estimates of probable utilization to that year.

The Twin Peaks line, with 14 stations about 0.62 mile apart, would serve to move 10,700 people in the dominant direction during the half-hour peak period, and provide facilities for 142,000 passenger trips

during a typical weekday. Eight-car trains on 3-minute headways during the rush period would average, including time for station stops, about 25 mph (miles per hour). The scheduled time from Daly City to First and Market Streets, for example, would be about 18 minutes.

The Marin-Richmond line would have 8 stations within the City and would carry 7,800 passengers in one direction during the peak half-hour of the day. About 64% of these would be passengers between points within the City. The line would be called upon to provide about 96,000 passenger trips on a weekday.

The Peninsula line, as noted before, would be primarily interurban in character. Of the 6,700 passengers it would carry in one direction during the peak half-hour, only about 1,000 would be traveling between points within the City.

The estimated first stage cost of way and facilities in San Francisco, exclusive of cars, would be:

Twin Peaks line	$104 million
Marin Richmond line	69
Peninsula line	75
Provision for future right-of-way	2
Total	$250

The recommended plan has been devised to broaden the usefulness of the system in the rapid movement of large numbers of people between areas of residential, commercial and industrial concentration, both within and

without the City of San Francisco. The Peninsula and the Marin-Richmond lines would provide such service from their outlying areas to downtown San Francisco. In addition the Marin-Richmond line would serve the large number of people daily who live in or adjacent to the Richmond district of the City. The Twin Peaks line would similarly move the people from within San Francisco and northwest San Mateo County to the downtown area.

I INTRODUCTION

The purpose of this study was to develop a rapid transit plan for the City and County of San Francisco, in coordination with the studies of the San Francisco Bay Area Rapid Transit District which would insure that the best interests of the people of San Francisco will be served.

The importance of rapid transit in San Francisco has long been recognized and a number of plans have been advocated for the development of a rapid transit system within the City and, more recently, within the entire Bay Area. For guidance in this study we have reviewed the most recent reports, as well as the studies currently being undertaken by the Bay Area Rapid Transit District.

Report on Rapid Transit for San Francisco - April 1950

The 1950 report was prepared by the Department of City Planning of the City and County of San Francisco, with De Leuw, Cather & Company as consultant. It included a review of the findings of all previous transit studies and is summarized below. The similarity in the principal features of the City Planning report, as well as those of the several previous proposals for rapid transit in San Francisco prepared by agencies and individuals with varying approaches, is significant.

Most previous plans have included a rapid transit subway on Market Street extending through the Twin Peaks Tunnel to serve the southwest section of the city. Variations were minor and consisted in such matters as exact location and terminals of the subway proposed for downtown Market Street and the area west of the tunnel.

Most of the previous proposals have also included provision for rapid transit extending south along the general alignment of Mission Street and then southwest to and along an unused right-of-way of the Southern Pacific Company. Here again there have been minor variations in respect to the downtown routing and termini, as well as the exact type of construction to be followed.

Similarly, there has been common agreement on a rapid transit operation to serve the Richmond District, extending westerly along the line of Geary Street from the downtown area. Some of the plans provided for rapid transit service by bus; others recommended rapid transit in subway. Again there were some variations in the termini and exact routing in the Richmond area and in the downtown district.

It was an assumption common to these plans that service to the Peninsula would continue to be furnished by the Southern Pacific Company, from the existing terminal at Third and Townsend Streets, with provision for ultimate extension to the Market Street subway. It was also assumed that transbay service would be provided by the Key System Transit Lines, and that Marin County would be served by Greyhound buses.

Other rapid transit or special services were recommended in various reports. There was no unanimity of thought with respect to rapid transit operation through the Sunset Tunnel, rapid transit service by operation of express buses on projected expressways, type of rapid transit car, or on a variety of other special problems.

It is evident that the engineers and planners who studied the problem in the past recognized the desirability of providing convenient delivery to points in the downtown area and were in agreement on the practicability of constructing a subway along Market Street to provide a trunk-line route from west of the Twin Peaks Tunnel to downtown San Francisco.

The 1950 study defined the City's requirements for rapid transit, and recommended construction of four lines within the city limits:

1. The Twin Peaks Line which would run under Market Street from about Fremont Street, through the Twin Peaks Tunnel, under West Portal Avenue, over the existing Municipal Railway right-of-way through Lakeside, under Nineteenth Avenue, and across Brotherhood Drive to an interchange station on the Mission line.
2. The Geary Line which would start at Market and Montgomery Streets, extend under Geary Street to Park Presidio Boulevard, and continue north on the mall to California Street.
3. The Mission Line which would branch off Market Street at Van Ness Avenue, extend south under South Van Ness Avenue and thence along the central mall of the then proposed Mission Freeway, to the interchange station with the Twin Peaks line near the junction of Alemany and Junipero Serra Boulevards.
4. The Sunset Line which would branch off the subway under Market Street near Duboce Avenue, extend west through the Sunset Tunnel, and thence underground along Lincoln Way to a terminal at Nineteenth Avenue.

In all, 38 subway stations were provided under this plan, to enable San Francisco riders to move rapidly between virtually all centers of population and business within the city. It was planned that each of these stations would be served by the extensive feeder routes of the Municipal Railway's streetcar and bus system.

Report on Rapid Transit for the Bay Area - January 1956

In a report to the San Francisco Bay Area Rapid Transit Commission, the consulting engineers engaged by the Commission recommended two routes within San Francisco as part of a regional rapid transit system.

1. The Eastbay-Peninsula Line would have entered the city in the vicinity of Washington Street from a proposed transbay tube, thence under Kearny and Market Streets, to Valencia Street, and south over Valencia on elevated structure to Tiffany Avenue. It would have continued from there in tunnel to the vicinity of Bosworth and Rotteck Streets, thence elevated over the center of Alemany Boulevard to San Jose Avenue, westward over private right-of-way paralleling the proposed Southern Freeway, southerly over the Southern Pacific Bernal Branch, thence via the old Municipal Railway right-of-way in San Mateo County to Burlingame, and from there south on the main line right-of-way of the Southern Pacific Company to Palo Alto.
2. The Marin Line would have originated at an underground station on Kearny Street at California in San Francisco and run underground north on Kearny Street and Columbus Avenue to Lombard

Street, under Russian Hill in tunnel to Van Ness Avenue. From there the line would have run west on elevated structure over Lombard Street to a station at Halleck Street in the Presidio, elevated through the Presidio and thence across the Golden Gate Bridge to Marin County.

Current Studies by BARTD

Since publication of the 1956 report, the San Francisco Bay Area Rapid Transit Commission has been replaced by a corporate entity known as the San Francisco Bay Area Rapid Transit District.

Engineers employed by the District and engineers, members and staff of the City's Technical Committee have worked together cooperatively in an endeavor to reach agreement on the rapid transit routes and facilities within San Francisco which will best serve the large number of people who may be expected to use the area-wide system.

Tentative agreement appears to have been reached with respect to the Twin Peaks and the Marin-Richmond routes.

Studies are still in progress, however, by BART engineers on alignment of the Peninsula route. These studies appear to be directed toward 1) determination of the relative merits of the routing as proposed in the 1956 report to the Commission and the routing into San Francisco over the main-line right-of-way of the Southern Pacific Company, as proposed by the Committee and 2) the best routing of the line within San Francisco, supposing the use of the Southern Pacific right-of-way were to be adopted.

The Committee's Plan for an Integrated System in San Francisco

Since the City's 1950 plan was conceived, the need for improved transit facilities within San Francisco has increased greatly. In particular the Twin Peaks and the Geary lines, which were amply justified by the number of potential passengers forseeable at the time, are even more urgently needed today.

Additionally, it is necessary now to take account of the effects of the rapid transit lines from Marin County, the East Bay and the Peninsula upon the City and its people.

In accordance, therefore, with the directive of the Board of Supervisors, by Ordinance 263-59 of May 18, 1959, the Transportation Technical Committee has conducted a study of the needs of the City and County of San Francisco for rapid transit facilities within the framework of the BARTD system. This study has led to certain conclusions which are embodied in this report.

Each of the recommendations is considered to be a necessity if the concept of an integrated rapid transit system adequate to serve the needs of all riders on an equitable basis is to be realized. Further, it is the Committee's belief, after detailed study and consideration, that the facilities and arrangements recommended will provide service benefits which are fully justified in the public interest.

This plan of the Committee proposes four rapid transit routes within the city limits:

1. A Twin Peaks line,
2. A Marin-Richmond line,
3. A Peninsula line, and
4. A Mission line,

all as shown on Plate 1. The first three of these are recommended for inclusion in the first stage of construction; the last one may be deferred, if necessary, to a second construction stage.

II ESTIMATES OF FUTURE RAPID TRANSIT PATRONAGE

The Committee, with assistance of its consultants, has prepared estimates of the number of passengers that may be expected to use the proposed rapid transit system within San Francisco. These estimates are based on study and analysis of data collected in previous years by the several city departments, on traffic counts and studies made by the city traffic department and other public agencies in this area, and on a comprehensive cordon count made by the Committee and embodied in a separate report dated July 1959.

Passengers originating in the Peninsula and Marin County areas were allocated to the interurban rapid transit routes by consultants to the San Francisco Bay Area Rapid Transit District. We have accepted and used these estimates for the purpose of this study. The number of passenger-trips into San Francisco originating from the northwest part of San Mateo County, and the number originating in San Francisco, have been estimated by the Committee.

The 1959 Cordon Count

A count was conducted in July, 1959, of all persons and vehicles crossing an imaginary cordon bounding the San Francisco Metropolitan Traffic District on a typical weekday between the hours of 7 a. m. and 7 p. m.

A crew of 40 men, consisting of personnel employed by the San Francisco Municipal Railway, Department of Public Works, and Utilities Engineering Bureau, participated in the cordon count, which was carried on during a period of two weeks. The number of vehicles and of passengers in

local transit cars and buses entering and leaving the Metropolitan Traffic District were counted, in half-hour intervals between 7 a. m. and 7 p. m. as they crossed the cordon line. A check of passenger vehicle occupancy was made at ten different locations in the cordon area, and the over-all average automobile passenger occupancy derived therefrom. The local transit passenger count was conducted by the Municipal Railway, and the out-of-town bus and passenger counts were provided by the individual bus companies. The count of railroad passengers was provided by the Southern Pacific Company. These data are tabulated and summarized in the report published by the Technical Committee and titled Cordon Count Data; Metropolitan Traffic District, July 1959.

The results of the cordon count provided basic data for the analysis of traffic on the various proposed rapid transit routes within San Francisco. Information on trips to downtown San Francisco by automobile and local transit were used as a basis for the estimates.

Estimates of future expansion of traffic movement into and out of downtown San Francisco were based on the comparative results of the two cordon counts.

A comparison of the number of persons (passengers plus pedestrians) entering and leaving the San Francisco Metropolitan Traffic District in 1947 vs. 1959 indicates the following:

	Persons Count (7 AM-7 PM) Nov 1947	July 1959 (adjusted)	% Increase or (Decrease)
Entering	586,732	618,762	5.4
Leaving	556,529	592,476	6.4
Total	1,143,261	1,211,238	5.9
Maximum accumulation (2 PM)	176,024	165,054	(6.2)

During the 12-year period the total number of persons entering and leaving Metropolitan Traffic District has increased approximately 6 per cent. However the net accumulation of persons, which is a more accurate indication of activity in the area, has actually decreased 6 per cent. All this in spite of the fact that the population of the five Bay Area counties has increased approximately 27 per cent between 1947 and 1959 - from 2,070,000 people to 2,636,000 people. Similar results have been experienced by other large metropolitan areas such as New York and Chicago.

For the purpose of this study, an increase of 1/2 per cent per annum or 5 per cent per decade, for traffic into downtown San Francisco has been used.

Allocation of Local Passenger-trips to Proposed Rapid Transit

The cordon count provided an accurate measure of the number of persons presently making use of transit vehicles and of automobiles and taxicabs for the daily trips between the outlying districts and downtown San Francisco. It was found that, of the maximum number of passengers accumulated daily in the downtown area, about half had used the transit vehicles and half had used the automobiles and taxicabs. A check on the relative number of local automobiles to local transit trips from the outlying areas of the City to the cordon area was made from consideration of the use of parking facilities within the cordon. The figures reached by the two methods were in substantial agreement.

Twelve-hour special counts were made by the Municipal Railway of the number of passengers carried past several points along each of the various transit lines leading to downtown San Francisco. Based on these counts, and a knowledge of traffic and land use in each of the segments into which the City was arbitrarily sub-divided in the 1947 Bay Area Metropolitan Traffic Survey, the number of daily downtown-bound transit passengers originating from each segment was estimated for the year 1959.

Based on the relation established by the cordon count an equal number of passengers was assumed to make the daily trip between district and downtown area by transit and by automobile and taxicab during 1959.

Existing movements of transit passengers in areas tributary to each of the proposed rapid transit routes were then considered. The area of influence of the Twin Peaks Route was considered to comprise contiguous districts within and adjacent to San Francisco, including Sunset, Parkside, Stonestown, Park Merced, Ingleside, St. Francis Wood, upper Market area, Westlake, and the northwest portion of San Mateo County. The area of influence of the Mission Route included the Mission and Outer Mission Districts. The Richmond District and the Western Addition area were considered to provide passengers for the Richmond Route. San Francisco passengers riding the Peninsula Route were assumed to originate at Visitacion Valley, Bay View and Hunters Point.

It was assumed that passengers destined within the cordon area would be distributed therein in the pattern revealed by both the Wilbur Smith and Associates Western Freeway report of December 1957 and by the Bay Area Metropolitan Traffic Survey.

Allocation of the potential rapid transit passengers from each of the tributary districts was made on the following basis. It was assumed that each rider now using local transit facilities would switch to the new local rapid transit facility as soon as it became available. Allocation of those potential rapid transit patrons who are now using automobiles was based on a time ratio curve derived from studies made by the Cook County Illinois Highway Department and modified to fit local conditions. This diversion curve relates the percentage of persons who would switch their patronage to rapid transit to the savings in trip-time which they would enjoy by so doing.

Rapid transit train running times were based upon speed-distance-time curves prepared for the District by an equipment manufacturer and on assumed station stops of 20-seconds in the outlying districts and 30-seconds in the downtown area. A bus feeder system was assumed and the total trip-time including walking, waiting and transfer time was computed between each outlying segment and each cordon segment.

A test series of automobile trips was made between outlying points and downtown points, during peak and off-peak periods. All elements of time were recorded, including the time to park, unpark, and to walk to and from the parking facility at each end of the trip. Segment-to-segment automobile trip times were thus developed.

The ratio of rapid transit trip time to automobile trip time was calculated for each segment-to-segment movement, and the percentage of transit trips determined from the diversion curve. This percentage was applied to the potential trips and the resulting number of trips was allocated to one of the rapid transit lines at the appropriate station. Potential trips from northern San Mateo County were treated in a similar manner, and the resulting trips were assigned to the Twin Peaks route.

The allocated local passenger-trips, based on the 1959 volumes, were increased by five per cent to estimate the 1969 level - the first year of rapid transit operation as planned by BARTD.

Estimated Number of Daily Passenger-Trips on Rapid Transit

The expression "daily passenger-trips" is defined as the number of passengers passing a given point in both directions on the line during a typical week-day. The estimated number of daily passenger-trips for the year 1969, on the proposed rapid transit system in San Francisco are shown on a flow chart, Plate 2. Included are the number of daily passenger-trips between San Francisco and other counties. These latter totals, as estimated by the District, were 75,000 for their Peninsula line (via the Mission route), 80,000 for the East Bay, and 30,000 for Marin.

The Twin Peaks line would serve more people than any other of the system. It is estimated that by 1969 approximately 142,000 passenger-trips will be made daily on this line past the maximum load point, south of the Civic Center Station.

The Marin-Richmond route would provide service for an estimated 96,000 passenger-trips daily past the maximum load point, between the Fillmore and Van Ness stations, and 64,000 passenger-trips past a point between the Arguello Boulevard station and the Park Presidio station. Of the latter approximately one-half would be Marin commuters; the remainder would be from the Richmond District.

The Peninsula route would furnish service principally to San Mateo County and Santa Clara County commuters, although it would provide some local service for San Francisco passengers. It is estimated that of the 75,000

passenger-trips assigned by the District to the Mission Route, about 12,000 would originate from the northwest portion of San Mateo County. Under the Committee's plan these would be carried on the Twin Peaks line, leaving 63,000 for the Peninsula line. At Bayshore station some 3,000 local passenger-trips would be added, making 66,000 total. Between Oakdale and Bryant stations the net increase is estimated at 9,000, making a total of 75,000 passenger-trips past that point, of which it is estimated 63,000 would be Peninsulan and 12,000 local.

A comparative study of a Twin Peaks route and a Mission route from Daly City to downtown San Francisco indicated that in 1969 the Twin Peaks line not only would serve approximately 40 per cent more passengers daily than the Mission line, but could be constructed for about $4 million less. It is on these findings that the Committee bases its recommendation that service to Daly City be provided initially over a Twin Peaks rather than a Mission route.

Estimated Peak-Period Passengers on Rapid Transit Lines

One of the most important factors in planning and arriving at the cost of any public transit facility is the estimate of the number of passengers to be carried during the morning and afternoon peak periods. On any given assumption as to the standard of service and car equipment to be operated, the peak period traffic determines the number of tracks to be built and the number and cost of cars to be purchased. It could also be a determining factor in the layout of proposed rapid transit subways in downtown San Francisco. Further, it is basic to estimates of operating expenses.

Peak period, as used in this report, is defined as the 30-minute period of an average weekday during which the number of passengers carried in the dominant direction past the point under discussion is a maximum. Peak-period percentage is defined as the number of passengers carried in the dominant direction past the point under discussion during the peak period, expressed as a percentage of the total number of passenger-trips past the same point on an average weekday. It is to be noted that the peak-period passengers passing a point are counted in one direction of travel only, whereas the all-day passenger-trips past the same point are counted in both directions of travel.

Before the automobile was in popular usage, public transit was the main mode of travel, and passenger loads were distributed fairly evenly during the day with a moderate increase at the peak hours. After World War II the expansion of metropolitan areas, increasing automobile ownership, and modern highway facilities, caused a shift in the mode of transportation from public transit to the private automobile. Public transit in metropolitan areas throughout the country was then confronted with an identical problem - its business became largely concentrated in three to four hours of the day. In the remaining period most of the equipment and manpower was idle. This fact is illustrated by the present riding pattern for the various forms of transportation within and from San Francisco at the peak period between 5:00 and 5:30 p. m. The same concentration of peak traffic occurs during the same period of the day on most rapid transit operations in America.

Estimates of the peak demand on the various lines of the proposed rapid transit system within San Francisco, made by the Committee's consultant, are based on information revealed by the 1959 cordon count of all traffic entering and leaving downtown San Francisco. The resulting estimates for 1969 are summarized in the following tabulation:

Line	Service	Daily Passenger-trips	30-Minute Peak Demand	
			Passengers	Per Cent
Twin Peaks	N. W. San Mateo County and San Francisco	142,000	10,700	7.5
Marin-Richmond	Marin	30,000	2,800	9.2
	San Francisco	66,000	5,000	7.5
	Total	96,000	7,800	
Peninsula	Peninsula	62,000	5,700	9.2
	San Francisco	13,000	1,000	7.5
	Total	75,000	6,700	

DESCRIPTION OF INDIVIDUAL ROUTES

Twin Peaks Route

A subway through the existing Twin Peaks tunnel and extending under Market Street toward the Ferry Building has been proposed in practically all of the many plans which have been considered over the years for solution of the mass transportation problem in San Francisco.

No basic changes have occurred, since the last of such plans, which would materially affect the pattern of transit desire lines within the City. The most recent studies indicate that such a Twin Peaks rapid transit line would carry about one and one-half times the number of riders to the central business district each day as would enter the City on the combined Peninsula and Marin lines. The solution of the problem here under study is the rapid movement of people to and from areas of residential, commercial and industrial concentration. The Peninsula, Marin and Transbay lines provide such service from their outlying areas to downtown San Francisco. The Twin Peaks line would similarly move the people from within San Francisco and northwest San Mateo County to the downtown area. For this reason such a line is considered to be essential for inclusion in the first stage of construction.

This line, shown on plan and profile on Plates 4, 5, 6 and 7, would start from a surface terminal station (Plate 16) in Daly City. This station and an associated storage yard and light maintenance shop are located approximately one-quarter mile south of San Francisco County. The line would enter the

City limits at Junipero Serra Boulevard and would there descend into a subway, proceeding northerly under Nineteenth Avenue, St. Francis Circle, West Portal Avenue through the existing Twin Peaks tunnel, under Market to Davis Street and north under Davis to a terminal located in the vicinity of Clay Street in the proposed Golden Gateway redevelopment project.

The bore of the Twin Peaks tunnel (Plate 3) would be enlarged sufficiently to afford proper side clearance for subway cars of the same width - approximately 10 feet 6 inches - as those proposed by the Bay Area Rapid Transit District for use elsewhere on the system. Suitable alterations would be made at Forest Hill Station and at the east and west portals, where connections would be made with new subway structure.

With the exception of two 2-level stations located on Market at Seventh and at First Street, and mentioned further in the description of the Marin-Richmond and the Peninsula lines, the stations between terminals would be of conventional construction. A typical subway station on Market Street is shown on Plate 17 and the two-level station at First and Market is shown on Plate 18. The total number of stations on the Twin Peaks line, including the terminals, would be 14. The line would be eight miles long, so that the average spacing between stations would be 0.62 mile.

Design of the stations on this, as on the other three lines within San Francisco, would be such as to provide a high standard of convenience, accessibility,

and esthetic satisfaction to the passengers using them. At the same time, cost would be held down to the lowest amount consistent with these criteria.

A typical station would have a mezzanine floor accessible from any one of several stairways and escalators from the sidewalk level. The mezzanine, brightly lighted and attractively finished, would have space available for lease to vendors of newspapers and magazines. It would also serve as a convenient and safe way for pedestrians to cross underground from one side of the street to the other. Where practicable in the downtown area, the mezzanine would open directly into one or more adjacent stores or office buildings. Passengers would move between the mezzanine and the train platforms either by stairways or by escalators. The platforms would be approximately 550 feet long for the accommodation of eight-car trains.

Stations served by heavily patronized surface feeder lines would be provided with rapid and convenient bus-to-train interchange facilities. Incoming buses would stop at the near end of a street level bus platform suitably designed to prevent pedestrians from entering the bus parking area. Inbound passengers would be discharged onto the platform, from which they would descend to the subway platform. The bus would then move to the far end of the bus platform, where it would load outbound passengers coming up from the train platforms.

The estimated cost of the Twin Peaks line is tabulated below:

COST OF TWIN PEAKS
RAPID TRANSIT LINE
(in millions)

County line to Golden Gateway terminal	$ 93
Widening Twin Peaks tunnel	11
Subtotal - Cost within San Francisco	$ 104
Construction of Way and Shops in San Mateo County	7
Total Cost of Twin Peaks line	$ 111 *

*No Rolling Stock Included

Marin-Richmond Route

Provision must be made for the daily movement, to and from the central business district of San Francisco, of 30,000 passenger-trips expected to cross the Golden Gate Bridge in 1969, as well as 66,000 passenger-trips in and out of the Richmond district.

At present the means by which the Marin commuters will cross the Golden Gate Bridge has not been resolved by the San Francisco Bay Area Rapid Transit District. In any event, the Committee recommends that the Marin-Richmond line extend to the downtown area from a point at least as far out as the vicinity of Park Presidio Boulevard and Geary Street.

This line, shown in plan and profile on Plates 8 and 9, would continue eastward in subway under Geary Street from the outer terminal to Presidio Avenue, cross over to Post Street at Baker, under Post Street to Leavenworth Street, where it would join the Peninsula line and then

continue under Post Street to Market Street, and easterly under Market Street, in the lower leval of a two level subway to a junction with the proposed transbay tube.

In addition to the Park-Presidio terminal, subway stations would be located at appropriate points along the route as shown in Plate 1. There would be eight stations on this four-mile line, including the outer terminal, and the distance between stations would average 0.56 miles, about the same as on the Twin Peaks route. Platform lengths would be 700 feet, to accommodate the ten-car trains planned by the District.

The station at First and Market Streets would serve as an interchange for passengers of the proposed Twin Peaks and future Mission routes on Market Street as shown on Plate 18. Escalators as well as stairways would be provided between the upper and lower train platforms and between each platform and the mezzanine for the convenience of passengers. Provision of additional tracks a short distance east of the lower level platform would permit those trains not required for service to the East Bay to turn back. Ramp tracks between the upper and lower level tracks would be provided also in this same general location. These would make possible the interchange of trains between routes, and would be particularly useful for transferring cars from the Peninsula or Marin-Richmond lines to the Daly City Shops for maintenance and light repairs, and for the movement of equipment from the Twin Peaks line to either of the other two lines to provide extra service for special events.

The estimated cost of this line is given below:

COST OF MARIN-RICHMOND
RAPID TRANSIT LINE
IN SAN FRANCISCO
(in millions)

Park-Presidio terminal to Post and Leavenworth	$60
Post and Leavenworth to Davis and Market Streets	9 (a)
Total	$69 *

Note (a): This portion of the line would be used jointly with the Peninsula route; one-half of the total cost of $18 million is allocated to each.

* Exclusive of Rolling Stock

Peninsula Route

The shortest and most direct transit route into San Francisco from the south Peninsula communities is over the existing main line right-of-way of the Southern Pacific Company, shown on Plates 12, 13, 14, and 15.

The practicability of adding an additional track, widening or constructing additional tunnels, providing necessary switches and cross overs, effecting grade separation, and equipping this line with a modern train control system has been studied and found to be both feasible and economical. More extensive studies and preliminary discussions with the engineering and management divisions of the Southern Pacific Company have confirmed the initial finding as to the feasibility and the potential economic advantage of this plan.

Under this plan the commuter service of the railway would be absorbed by the proposed Bay Area rapid transit system. Multiple unit, high-speed, electric trains would be operated on two tracks under Centralized Train Control (CTC). The third track, and a system of passing sidings, would be used by the six daily Southern Pacific passenger trains to and from Los Angeles and Monterey, and by freight trains in both directions. The tracks would be grade separated from crossing streets and highways, starting from the terminal south of Palo Alto.

It is the belief of the Committee that under CTC, the combined traffic of the BARTD and the Southern Pacific systems could be handled without mutual interference or delays. However, in the event that further study should indicate the desirability of grade separating the two systems at points where the Southern Pacific serves industries on the west side of the tracks, it has been determined that such separations are entirely practical and could be carried out for something less than $6 million total.

North of the San Francisco county line the route would occupy a part of the Southern Pacific Right of Way to the vicinity of Seventh and Hooper Streets, where the two tracks allocated to rapid transit would enter a subway section and follow under Seventh and Leavenworth Streets to Post Street. Here the Peninsula line would join that of the proposed Marin-Richmond route and continue eastward under Post Street to Market and under Market Street to the transbay tube.

The two stations in San Francisco along that part of the right-of-way used jointly with the Southern Pacific Company would be located in the vicinity of Visitacion Avenue and Oakdale Avenue and would be surface structures.

Subway stations would be located at or near Seventh and Bryant, Seventh and Market, Post at Powell, Post and Kearny, and Market and First Streets. Of these five sub-surface structures two deserve special mention. The station at Seventh and Market Streets would connect with the proposed rapid transit lines under Market Street, which would cross over some 20 feet above the Peninsula line. Escalators would be provided between the upper and lower platforms of this subway station for convenient transfer of passengers between the two lines. The two-level station at First and Market Streets, which would be of similar functional design, has been described in the section on the Marin-Richmond route.

The cost of constructing and installing the facilities necessary to adapt the Southern Pacific right-of-way and existing trackage to rapid transit services would be materially less than the cost of constructing the alternate proposed line into San Francisco from San Bruno to Daly City, thence via a Mission route to Market and eastward under Market to the Transbay tube. The comparative costs, tabulated below, indicate that a saving of some $43 million could be effected by adoption of the recommended route. In addition, it is possible that the municipalities affected and the state may contribute substantially to the expense of grade separation, the cost of which has been included in the table. Thus the saving in capital outlay required by the District could be in excess of $43 million.

COMPARATIVE COSTS OF
PENINSULA RAPID TRANSIT WAY FACILITIES
INTO SAN FRANCISCO FROM
SAN BRUNO TO DAVIS AND MARKET STREETS
(in millions)

	(1) Mission Route	(2) S. P. Route
San Bruno to San Francisco County line	$ 25	$12
San Francisco County line to Davis and Market Streets	105 (a)	
San Francisco County line to Seventh and Hooper Streets		37 (b)
Subtotal		$49
Seventh and Hooper to Post and Leavenworth Streets		29
Post and Leavenworth to Davis and Market Streets	____	9 (c)
Total	$130 *	$87 *

Note (a): Includes 7 stations between the County line and Market Street located at Sickles Avenue, Ocean Avenue, Bosworth Street, Cortland Avenue, 24th, 20th, and 16th Streets.

Note (b): Includes 3 stations between the County line and Market Street located at Visitacion Avenue, Oakdale Avenue, and Bryant Street.

Note (c): This portion of the line would be used jointly with the Marin-Richmond route; one-half of the total cost of $18 million is allocated to each.

* Exclusive of Rolling Stock

Mission Route

In the section "Estimates of Future Rapid Transit Patronage" mention was made of a Mission route, which had been studied independently, and it was noted that such an alternate Mission line would cost some $4 million more to build and would serve only 70 per cent as many transit riders as the Twin Peaks line, assuming both from the same point of origin. These considerations and recognition of the probable need of postponing capital expenditure for one or the other of these lines to a later stage, led to the decision to recommend that construction of the Mission line be deferred to Stage 2 of the area-wide development of the system.

Although such postponement is considered to be prudent, this conclusion is not to be interpreted as a reflection on the importance of or the need for this addition to the system. Indeed, the Committee recommends that the Mission line be programmed for construction at the earliest possible date following completion of the Stage 1 construction.

The line as recommended, shown in plan and profile on Plates 10 and 11, would start from a terminal at Ocean Avenue and the proposed Southern Freeway. The tracks would be located in the center mall of the Freeway from Ocean Avenue to the vicinity of Hearst Avenue where the line would enter a subway section and would continue under Chenery and Mission Streets to Market. Here the two-track tube would separate into two single-track tubes. The inbound tube would turn east and join the Market Street tube of the Twin Peaks line. The Mission route from this point would share the tracks under Market Street jointly with the Twin Peaks route,

terminating in the Golden Gateway station at Davis and Clay Streets. The outbound track on Market Street would switch westerly for a short distance, then turn southerly under the Market Street subway and rise to join the two-track section under Mission Street.

Assuming an initial terminal at Ocean Avenue, six stations would be provided on that part of the line which lies south of Market Street or a total of 12 stations, including those on Market Street and the Golden Gateway terminal, with an average spacing of approximately 0.56 mile.

At the scheduled time for construction of the Mission line the subway under Market Street would have been completed as a part of the Twin Peaks route, and stub lines constructed for later connection to the Mission line. The additional construction for the Mission line would therefore be confined to that portion of the route between Ocean Avenue and Market Street. The incremental cost of this work is estimated at $67 million.

Provision for the costs which would be necessary to secure ultimate use of about a mile of the center mall of the Southern Freeway to Ocean Avenue, as part of the right-of-way, would have to be made immediately; this is estimated at $2 million. The remaining $65 million would not be required until Stage 2 of the construction program.

V DISCUSSION OF RAPID TRANSIT ROLLING STOCK

Cars for Use on the Suburban Routes

The Committee is informed that the BARTD has not adopted final specifications applicable to suburban rapid transit cars. However, the following data is believed to conform to the present thinking of their engineers:

Multiple Unit Rapid Transit Car
For Through-Service on BARTD System

Length over vestibule	67' - 3
Width at floor level	10' - 6"
Number of seat spaces	76
Floor Height above rails	3' - 9" 1/
Weight of car without passengers, lb.	68,800
Motor horsepower, 1-hour rating, each	145
Number of motors	4
Miles per hour, maximum speed	80

The cars would be coupled into trains of up to ten cars, with a length of approximately 675 feet.

Traction motors of the rating and characteristics proposed by the District are larger than any of the same type that have been built heretofore. It is understood that preliminary studies indicate that such motors are practical and that they would be capable of imparting a constant acceleration of three miles per hour per second to the cars for 15 seconds. This would bring the train up to a speed of 45 mph in a distance of 495 feet.

After reaching the speed of 45 mph indicated above, the motor current would gradually decrease with corresponding reduction in the rate of acceleration. Although the speed would continue to increase, it would do so more and more slowly until it finally leveled off at about 80 mph.

Because of the greater distance and correspondingly long commuting times, the District is understood to plan seats for all passengers on the through routes during the rush hours.

Cars for Use on the Intra-City Routes

The Committee recognizes that, insofar as practicable, rapid transit cars for service on the intra-city routes should be of the same general design as those for use on through routes.

If mechanically feasible, it would be desirable to use identical trucks under each type of car. However, in order to furnish adequate service to San Francisco riders, the station spacing would be reduced to something of the order of 1/2 mile. By reason of the reduction in maximum speed attainable in this shorter distance it is probable that standard motors of 100 horsepower would be adequate to provide the optimum rate of train acceleration.

While the Committee does not consider it to be within the scope of this assignment additional studies of rolling stock are continuing to the end that when the Bay Area Rapid Transit District has determined the type of equipment they will use, the Committee will make definite recommendations thereon.

The running time from Daly City to First and Market Streets via the Twin Peaks line on the intra-city rapid transit routes would be 18 minutes. Under these circumstances provision of seats for all passengers during the times of maximum loading would not be necessary and would be prohibitively expensive. It is therefore quite possible that the interior arrangement of seats in the cars for use on the Twin Peaks and the Mission lines would differ from that used on the suburban cars. In general, the practice elsewhere in this country is to so arrange seats on cars which are expected to carry standees, that the aisle width is a maximum. This is often accomplished by substitution of longitudinal seats, at least in part, in place of transverse seats.

The terminal-to-terminal trip-time on the Twin Peaks line is estimated to be 19 minutes. Allowing for a three-minute layover at each terminal, number of cars required for peak-load service on this local route will be about 117. The total number of cars, allowing for reasonable outage for maintenance and repair, would be about 128.

VI OPERATING FEATURES

Having determined the design and characteristics of the rolling stock, the number and spacing of stations and the passenger load throughout the day provide the basis for designing train schedules.

It is assumed that the San Francisco Municipal Railway would provide feeder bus service to all of the proposed rapid transit stations. This would require some changes in the existing Municipal Railway network, and a satisfactory agreement would have to be reached between BARTD and the City regarding fare collections, transfer privileges and allocation of revenue.

It is further assumed that the proposed rapid transit system would be operated on a 21-hour daily basis to permit shut-down between 2 a.m. and 5 a.m. This has been found practicable on rapid transit systems elsewhere and results in worthwhile reductions in expenses during the three-hour period. Cleaning and maintenance work can be carried on with maximum efficiency and labor costs significantly reduced. Buses would be scheduled to provide the necessary service along the rapid transit routes during these three owl hours. On weekends and holidays, trains would operate at less frequent intervals than on weekdays, with schedules adjusted to suit passenger demand.

Calculations of travel times were based upon a manufacturer's suggested speed-distance-time curves prepared for BARTD. Station stop times were determined from data available on the time required to load and

unload passengers on existing rapid transit systems. Thirty seconds were assumed for stops at stations in the downtown area; twenty seconds for all other intermediate station stops.

The operating features of each of the rapid transit routes recommended for construction in San Francisco are set forth below.

The Twin Peaks Route

This line would operate between Daly City and the Golden Gateway Terminal at Davis and Clay Streets in the Central Business District. One-way travel time between the two terminals is estimated to be 19 minutes and 13 seconds and the round trip time including three minutes for turn-around at each end, is estimated at 44 minutes. The average over-all speed would be 25 mph. The distances and travel times between stations and the time from the first station are shown in Table 2.

During peak hours, eight-car trains would be scheduled at three-minute headways. Maximum headways of five minutes are suggested during the midday period, utilizing six-car trains. During the evening and night hours, service would be provided by four-car trains at headways ranging from eight to ten minutes.

During the rush period it would be necessary to carry standees, but this standing load would be limited to the relatively short run between the Fifth Street and Forest Hill stations. Seats would be provided for all passengers during the rest of each weekday and during the entire day on weekends and holidays. This conforms to the best service provided by modern urban

rapid transit systems throughout the country.

Buses from northern San Mateo County would deliver passengers to a modern bus-to-rail transfer terminal at Daly City. A large parking area would be available to accommodate parking of private automobiles.

The Marin-Richmond Route

This line would operate between Marin County and downtown San Francisco. Within San Francisco, the route would run under Geary and Post Streets between the Park Presidio and First Street stations. The one-way travel time is estimated to be about ten minutes and the average over-all speed about 24 mph. The distance and travel times between stations and the time from the first station are shown on Table 3.

The studies of the Committee indicate that joint operation of the Peninsula route and the Marin-Richmond route in a single subway under Post Street in downtown San Francisco is feasible. During the peak period, eight-car trains on the Marin-Richmond route would be scheduled with headways of three minutes, the same as for the Peninsula route. The combined headway of the trains of the two routes would therefore be 90 seconds in the downtown area. One-half of the trains on the Marin-Richmond route would be operated between downtown San Francisco and the Park Presidio station, the intermediate trains continuing on to Marin County. This operation, conducted on a split service basis, would provide headways on the Marin County service of six minutes during the peak period. During the midday period, headways of four to eight minutes would be scheduled for the San Francisco

portion of the route, utilizing three to six car trains. Service during the evening and night hours would be furnished by two-car trains operating on headways of 10 to 15 minutes in San Francisco.

During the rush hours some passengers would be standees between Arguello and Powell Stations. However, seats would be provided for all passengers from Marin County during the morning rush hours. Seats for all passengers would be provided also during off-peak hours of each weekday and during the entire day on weekends and holidays.

The Peninsula Route

This line would operate between a terminal just south of Palo Alto and downtown San Francisco, and would continue on to the East Bay. Within the City the line would operate between Bayshore station, just north of the county line, and the First Street station in downtown San Francisco. The distance between these stations is 6.5 miles and one-way travel time is estimated at a little over 11 minutes. Seven stations are contemplated along this portion of the route, with average distance between stations about 1.1 miles. The average over-all speed would be slightly over 37 mph. The distance and travel time between stations and the time from the first station are shown in Table 5.

During peak periods, eight-car trains would be scheduled on a headway of three minutes. Maximum headways of 15 minutes would be scheduled during the midday period, utilizing two to four car trains. During a portion of the rush period, it would be necessary to carry a small number of

standees, but the standing load would be limited to the relatively short run between Oakdale and Seventh Street stations. However, seats would be provided for all Peninsula passengers during the morning rush period. During the remaining hours of operation, and on weekends and holidays throughout the whole day, seats would be available for all passengers.

The Mission Route

After the Mission route is built, under the second stage of construction, it would operate on a split service basis with the Twin Peaks route through the subway under Market Street. The construction of the Mission route would tend to decrease the patronage on the Twin Peaks route, and it is therefore estimated that a combined headway of two minutes for these two lines during the peak period would be sufficient. Such a headway would include sufficient margin for adjustment to provide for future growth of the area served. The distances and travel times along the Mission route are shown in Table 4.

TABLE 1

COMPARISON OF CORDON COUNTS RESULTS
For Downtown San Francisco
Typical Weekday

12 Hour Passenger Count 7 AM - 7 PM

	1959				1947			
			Total				Total	
	Entering	Leaving	No.	%	Entering	Leaving	No.	%
Autos & Taxis	453,457	435,900	889,357	72.5	270,038	258,573	528,611	50.5
Local Transit	134,727	131,742	266,469	21.7	212,176	201,597	413,773	39.6
Out-Town Bus	24,719	24,999	49,718	4.0	17,632	17,146	34,778	3.3
Railway (a)	11,047	10,541	21,588	1.8	35,440	33,515	68,955	6.6
Total	623,950	603,182	1,227,132	100.0	535,286	510,831	1,046,117	100.0

Peak-Hour Passenger Count

	1959				1947			
	Entering 7:30-8:30 AM		Leaving 4:30-5:30 PM		Entering 1:30-8:30 AM		Leaving 4:30-5:30 PM	
	No.	%	No.	%	No.	%	No.	%
Autos & Taxis	61,886	53.8	71,190	56.1	41,017	35.8	47,585	41.2
Local Transit	36,455	31.7	28,271	30.2	54,726	48.0	49,482	42.6
Out-Town Bus	9,051	7.9	10,000	7.9	4,116	3.6	4,843	4.2
Railway	7,541	6.6	7,400	5.8	14,562	12.6	13,926	12.0
Total	114,933	100.0	126,861	100.0	114,421	100.0	115,836	100.0

Maximum Net Accumulations (2 PM)

	1959		1947	
	Passengers	Vehicles	Passengers	Vehicles
Autos & Taxis	69,129	43,236	46,259	30,782
Local Transit	63,004	246	94,722	205
Out of Town Bus	13,162	106	5,651	65
Railway	10,295	--	21,384	--
Total	155,590	43,588	168,016	31,052

Note (a) Elimination of trains on the San Francisco-Oakland Bay Bridge in 1958 caused a portion of the commuter traffic to shift to out-of-town buses.

TABLE 2
TWIN PEAKS ROUTE
DISTANCES & RUNNING TIMES

Station	Distance (Miles) Between Stations	Distance (Miles) From First Station	Time (minutes and seconds) Between Stations	Time (minutes and seconds) Station Stop	Time (minutes and seconds) From First Station
Daly City		-		-	-
	1.28		1'-47"		
Park Merced		1.28		20"	1'-47"
	0.34		49"		
Stonestown		1.62		20"	2'-56"
	0.60		1'-07"		
St. Francis		2.22		20"	4'-23"
	0.51		1'-01"		
West Portal		2.73		20"	5'-44"
	0.58		1'-06"		
Forest Hill		3.31		20"	7'-10"
	1.79		2'-14"		
Castro		5.10		20"	9'-44"
	0.46		57"		
Church		5.56		20"	11'-01"
	0.71		1'-14"		
Civic Center		6.27		30"	12'-35"
	0.43		56"		
Seventh Street		6.70		30"	14'-01"
	0.33		48"		
Fifth Street		7.03		30"	15'-19"
	0.32		47"		
Third Street		7.35		30"	16'-36"
	0.32		47"		
First Street		7.67		30"	17'-53"
	0.35		50"		
Golden Gateway		8.02		-	19'-13"

Average Over-all Speed: 25.0 mph
Average Distance Between Stations: 0.62 miles

TABLE 3
MARIN-RICHMOND ROUTE
DISTANCES & RUNNING TIMES

Station	Distance (Miles) Between Stations	Distance (Miles) From First Station	Time (minutes and seconds) Between Stations	Time (minutes and seconds) Station Stop	Time (minutes and seconds) From First Station
Park Presidio		--		---	---
	0.65		1'-10"		
Arguello		0.65		20"	1'-10"
	0.55		1'-03"		
Masonic		1.20		20"	2'-33"
	0.87		1'-24"		
Fillmore		2.07		20"	4'-17"
	0.62		1'-08"		
Van Ness		2.69		30"	5'-45"
	0.71		1'-14"		
Powell		3.40		30"	7'-29"
	0.27		44"		
Kearny		3.67		30"	8'-43"
	0.28		45"		
First Street		3.95		---	9'-58"

Average Over-all Speed: 23.8 mph
Average Distance Between Stations: 0.56 miles

TABLE 4
MISSION ROUTE
DISTANCES & RUNNING TIMES

Station	Distance (Miles) Between Stations	Distance (Miles) From First Station	Time (minutes and seconds) Between Stations	Time (minutes and seconds) Station Stop	Time (minutes and seconds) From First Station
Ocean		-		-	-
	1.09		1'-37"		
Bosworth		1.09		20"	1'-37"
	0.83		1'-22"		
30th Street		1.92		20"	3'-19"
	0.78		1'-18"		
24th Street		2.70		20"	4'-57"
	0.44		56"		
20th Street		3.14		20"	6'-13"
	0.42		55"		
16th Street		3.56		20"	7'-28"
	0.81		1'-21"		
Civic Center		4.37		30"	9'-09"
	0.43		56"		
Seventh Street		4.80		30"	10'-35"
	0.33		48"		
Fifth Street		5.13		30"	11'-53"
	0.32		47"		
Third Street		5.45		30"	13'-10"
	0.32		47"		
First Street		5.77		30"	14'-27"
	0.35		50"		
Golden Gateway		6.12		-	15'-47"

Average Over-all Speed: 23.2 mph
Average Distance Between Stations 0.56 miles

TABLE 5
PENINSULA LINE
DISTANCES & RUNNING TIMES IN SAN FRANCISCO

Station	Distance (Miles) Between Stations	Distance (Miles) From First Station	Time (minutes and seconds) Between Stations	Time (minutes and seconds) Station Stop	Time (minutes and seconds) From First Station
Bayshore		--		--	--
	1.87		2'-18"		
Oakdale		1.87		20"	2'-18"
	2.73		3'-02"		
Bryant		4.60		20"	5'-40"
	0.59		1'-06"		
Seventh Street		5.19		30"	7'-06"
	0.76		1'-17"		
Powell		5.95		30"	8'-53"
	0.27		44"		
Kearny		6.22		30"	10'-07"
	0.28		45"		
First Street		6.50		--	11'-22"

Average Over-all Speed: 37.5 mph
Average Distance Between Stations: 1.08 miles

TABLE 6
ESTIMATED COSTS WAYS & FACILITIES
RAPID TRANSIT IN SAN FRANCISCO
STAGE 1
(In millions)

1.	Twin Peaks line:		
1.	County line to Golden Gateway terminal station	$ 93	
2.	Widening Twin Peaks tunnel	11	
3.	Subtotal - Cost in San Francisco	$104	$104
4.	Construction of Way, shops and terminals in San Mateo County	7	
5.	Total - Cost of line including San Mateo County	$111	
2.	Marin-Richmond line:		
1.	Park Presidio to Post and Leavenworth Streets	$ 60	
2.	Post and Leavenworth to Davis and Market Streets	9 (a)	
3.	Total - Cost of line	$ 69	69
3.	Peninsula line:		
1.	County line to Seventh and Hooper Streets	$ 37 (b)	
2.	Seventh and Hooper to Post and Leavenworth Streets	29	
3.	Post and Leavenworth to Davis and Market Streets	9 (a)	
4.	Total - Cost of line	$ 75	75
4.	Mission Line: (Stage 1 expense)		
1.	Provision for use of Southern Freeway mall		2
	Total System Cost in San Francisco - Stage 1		$250 (c)
5.	Mission line: (Stage 2)		
1.	Ocean Avenue to Civic Center		65
	Total System Cost in San Francisco - Stage 2		$315 (c)

Note: (a) The cost of this portion of the line, $18 million, is allocated equally between the Richmond-Marin and the Peninsula lines

(b) Includes three recommended stations between the County line and Market Street

(c) Exclusive of rolling stock

APPENDIX A

BOARD OF SUPERVISORS

MEETING OF APRIL 13, 1959

RECOMMENDATION OF JOINT FINANCE AND PUBLIC UTILITIES COMMITTEE

Present: Supervisors McMahon, Ertola, Ferndon, Halley.

Motion Directing Initiation of Supplemental Appropriation For Local Transit Study To Be Coordinated With San Francisco Bay Area Rapid Transit District Survey.

It is moved that the Clerk of the Board of Supervisors be and he is hereby authorized and directed to initiate a request for a supplemental appropriation of $125,000 from such funds as are available, to be subject to the administration of the Chief Administrative Officer, and to be expended by work order to the several City and County departments concerned, for the purpose of conducting a transit study in coordination with the survey to be undertaken by the San Francisco Bay Area Rapid Transit District, said San Francisco study to be conducted under the direction of the Public Utilities Commission - Utilities Engineering Bureau, with authority to hire such consultants in specialized fields as may be required; it being stipulated that said study is to receive general policy guidance from the Mayor's Transportation Council, that monthly progress reports shall be submitted to the Board of Supervisors, the Mayor, and the Mayor's Transportation Council, and that the final report and recommendation is to be submitted to the same officials; and it being further stipulated that the contemplated work will involve preparation of preliminary plans, design and estimates of a local San Francisco transit system and recommendations pertaining to San Francisco's requirements in connection with the proposed San Francisco Bay Area Rapid Transit System as may be proper to insure the best interests of the people of San Francisco.

File No. 12476

Question on adoption PASSED

APPENDIX B

FILE NO. 12476-4 ORD. NO.——
APPROPRIATING $125,000 FOR PROFESSIONAL AND SPECIAL SERVICES; CHIEF ADMINISTRATIVE OFFICER.

Be It Ordained by the People of the City and County of San Francisco:

Section 1. Appropriation of $125,000 is hereby made from the Unappropriated Balance of the General Fund (G.L. 2990) to Appropriation No. 8.221.269.000 (Professional and Special Services) to provide funds for local transit study; Chief Administrative Officer.

I hereby certify that the foregoing ordinance was passed for second reading by the Board of Supervisors of the City and County of San Francisco at its meeting of May 11, 1959.

ROBERT J. DOLAN, Clerk.

May 16, 1959—1t.

NOTICE OF FINAL PASSAGE
FILE NO. 12476-4 ORD. NO. 263-59
APPROPRIATING $125,000 FOR PROFESSIONAL AND SPECIAL SERVICES; CHIEF ADMINISTRATIVE OFFICER.

I hereby certify that the foregoing ordinance was read for the second time and finally passed by the Board of Supervisors of the City and County of San Francisco at its meeting of May 18, 1959.

L. M. SENTER, Acting Clerk

Approved May 21, 1959.

GEORGE CHRISTOPHER, Mayor

May 26, 1959—1t

APPENDIX C

DECLARING POLICY THAT CITY AND COUNTY OF SAN FRANCISCO AGENCIES SHALL COOPERATE WITH BAY AREA RAPID TRANSIT DISTRICT FOR DEVELOPMENT OF A RAPID TRANSIT PLAN FOR OPERATION IN SAN FRANCISCO AND BAY AREA.

RESOLUTION NO. 701-59

WHEREAS, A Preliminary Plan for a Bay Area Rapid Transit System was prepared by the then existing San Francisco Bay Area Rapid Transit Commission in January, 1956, which plan was designed to provide mass transit for the residents of the San Francisco Bay Area; and

WHEREAS, It was then assumed that such a Bay Area system would be supplemented in San Francisco by a locally developed and financed local rapid transit system to serve areas not served by the regional system; and

WHEREAS, The plan is now being reviewed and revised by the San Francisco Bay Area Rapid Transit District before its submission to the voters of the said District; and

WHEREAS, The San Francisco Board of Supervisors has appropriated $125,000 to the Chief Administrative Officer to develop, in cooperation with other affected San Francisco departments, a plan which would complement the bay-wide system and effectively serve local rapid transit needs; and

WHEREAS, A Technical Committee composed of City Planning, Public Utilities, Municipal Railway, Parking and Public Works representatives concurred in by the Mayor's Transportation Council, has concluded that the development of two separate rapid transit systems in San Francisco would not be feasible; and

WHEREAS, Any Bay Area Rapid Transit System would be incomplete if it failed to provide easy access to and from the heavily populated residential districts of San Francisco as well as the less heavily populated districts in other parts of the Bay Area; and

WHEREAS, It is believed that a rapid transit system can be tied in with local feeder lines to provide mass transit for both the longer-distance "express" type of patronage and the short haul high density urban mass travel patronage, now, therefore, be it

RESOLVED, That it is the policy of the City and County of San Francisco that the several departments through the Mayor's Transportation Council cooperate with the Bay Area Rapid Transit District to the end that a plan for a rapid transit system be developed giving equal consideration to the needs of all residents within the boundaries of the District, regardless of corporate boundaries.

I hereby certify that the foregoing resolution was adopted by the Board of Supervisors of the City and County of San Francisco at its meeting of August 31, 1959.

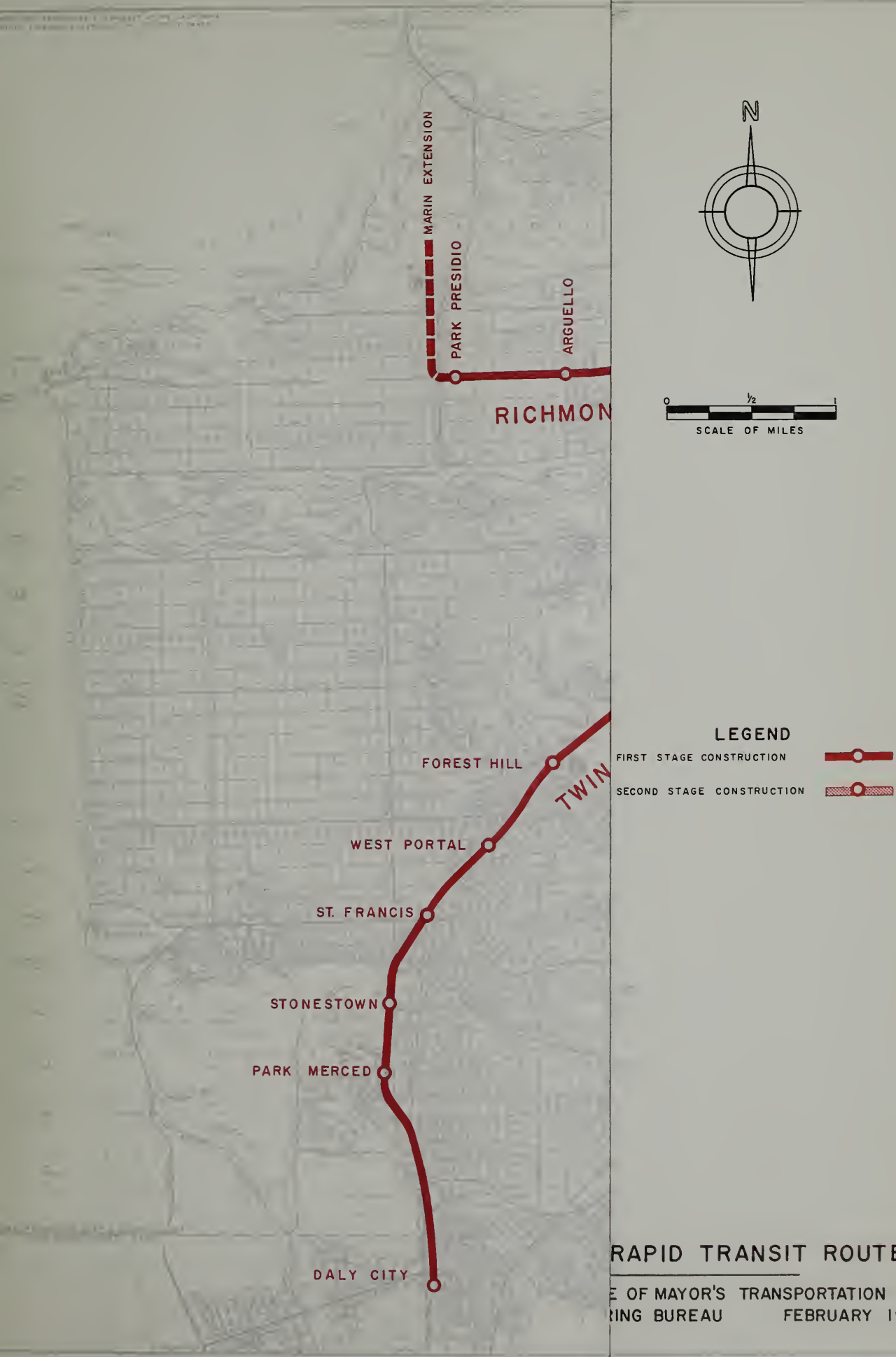
ROBERT J. DOLAN, Clerk.

Approved September 3, 1959.

GEORGE CHRISTOPHER, Mayor.

September 5, 1959—1t

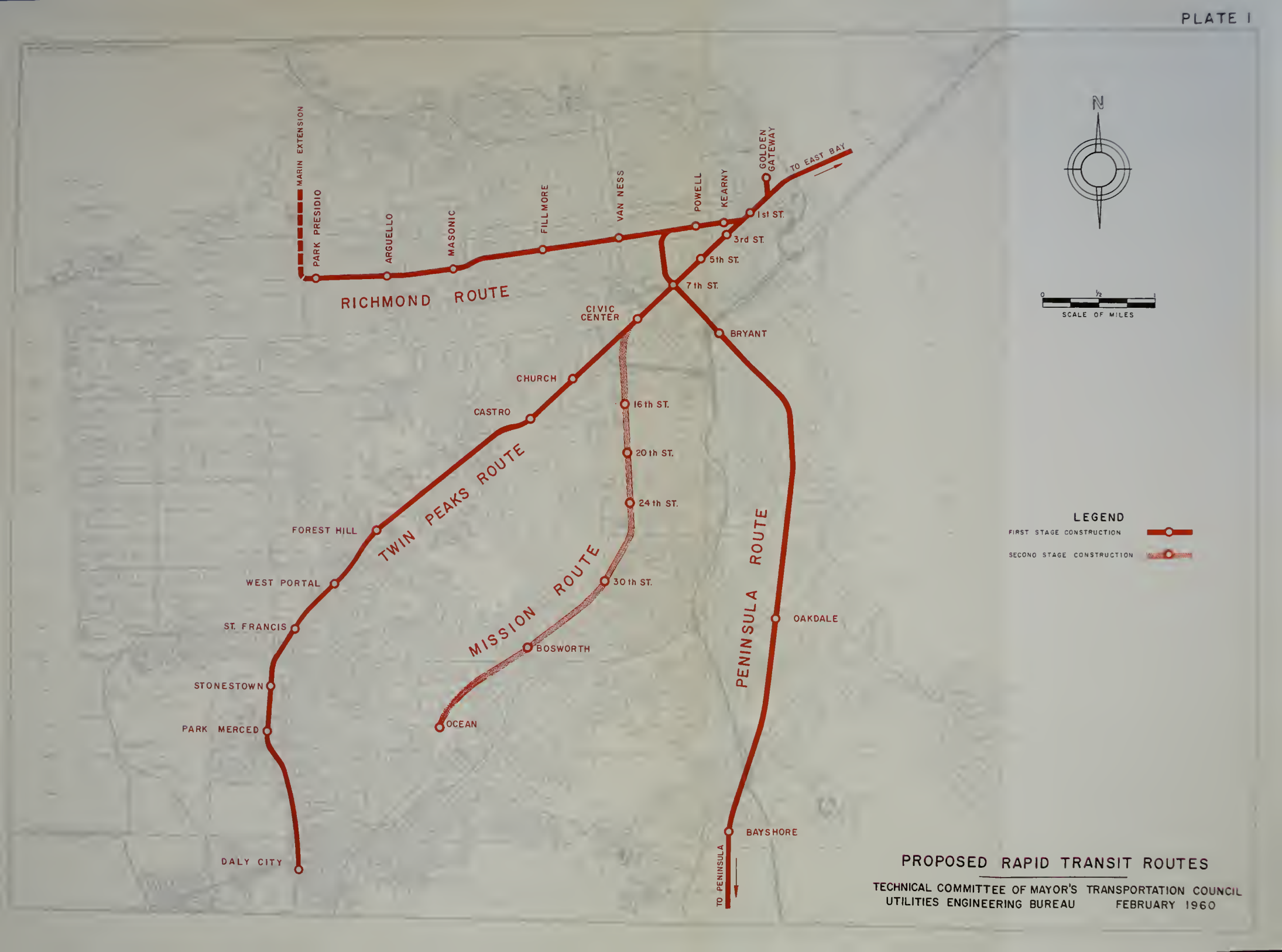
PLATE I



RAPID TRANSIT ROUTES

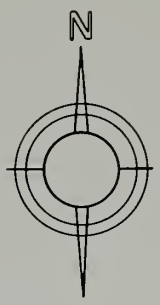
E OF MAYOR'S TRANSPORTATION COUNCIL
NING BUREAU FEBRUARY 1960

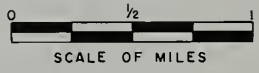
PLATE I

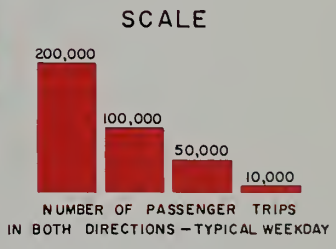


PROPOSED RAPID TRANSIT ROUTES

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960







TIMATED NUMBER
OF
SSENGER TRIPS — 1969

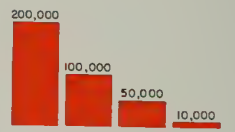
OF MAYOR'S TRANSPORTATION COUNCIL
NG BUREAU FEBRUARY 1960

NOTE DISTRIBUTION OF EAST BAY PASSENGERS IN SAN FRANCISCO NOT SHOWN

N

0 ½ 1
SCALE OF MILES

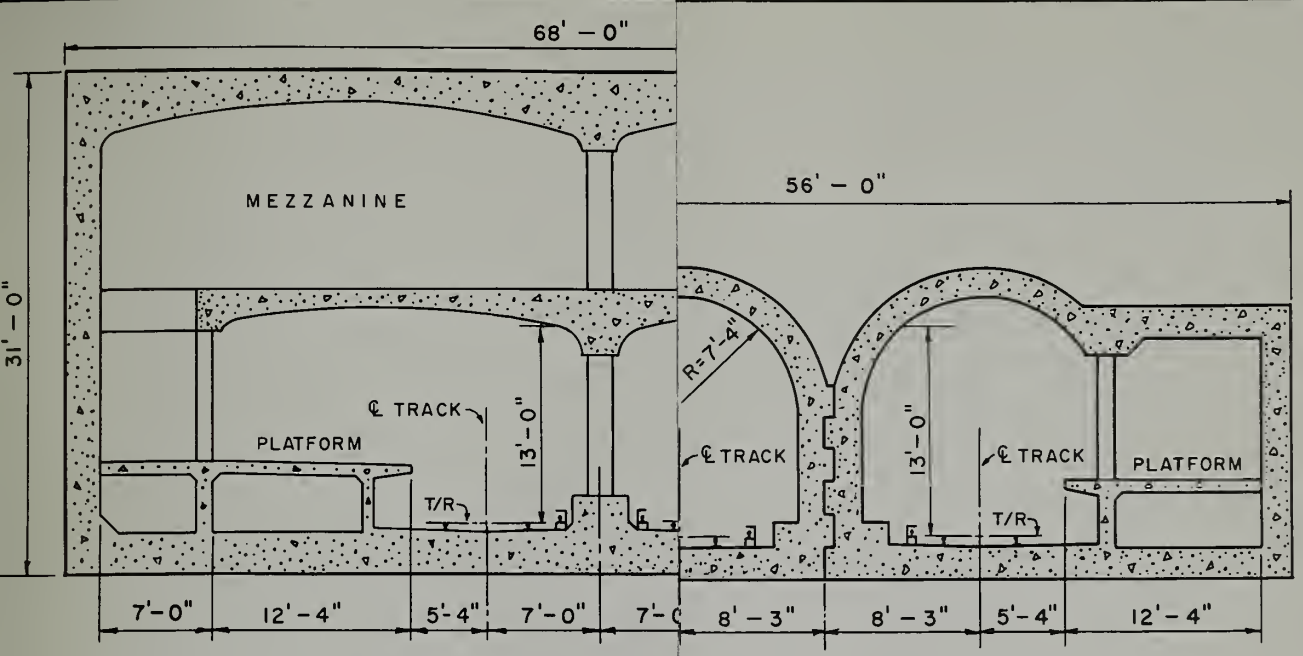
SCALE



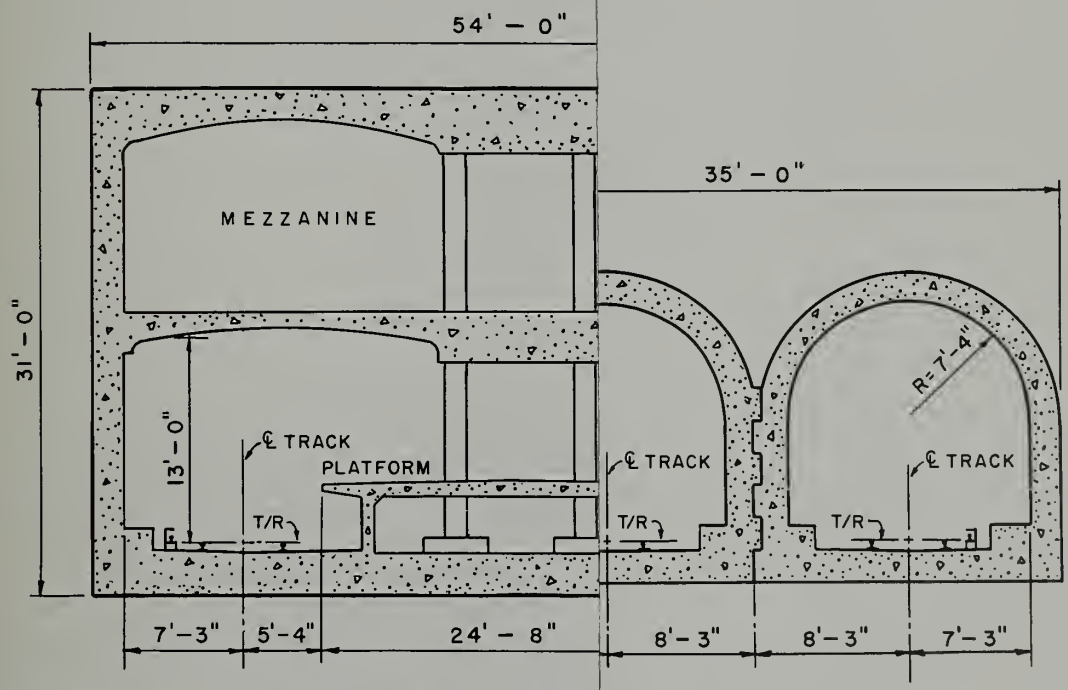
NUMBER OF PASSENGER TRIPS IN BOTH DIRECTIONS – TYPICAL WEEKDAY

ESTIMATED NUMBER OF DAILY PASSENGER TRIPS – 1969

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU
FEBRUARY 1960



SIDE PLATFORM STATION — TUNNEL STATION



CENTER PLATFORM STATION — TUNNEL

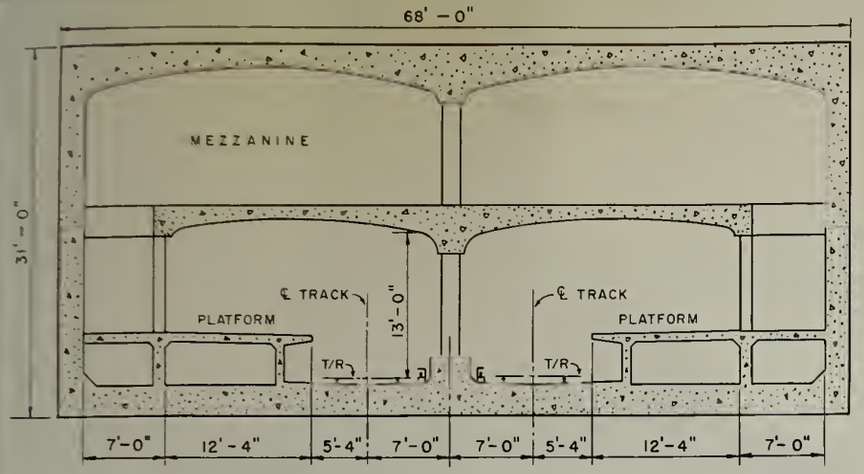
ETWEEN STATIONS

NOTE:
T/R – TOP OF RAIL

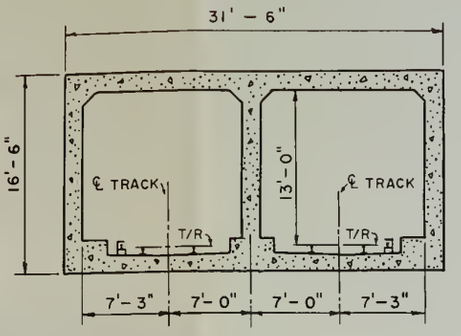
ONS FOR TUNNEL CONSTRUCTION MAY BE FOUND
AFTER DETAILED EXPLORATION. PRELIMINARY
ON THESE SECTIONS.)

TYPICAL SUBWAY SECTIONS

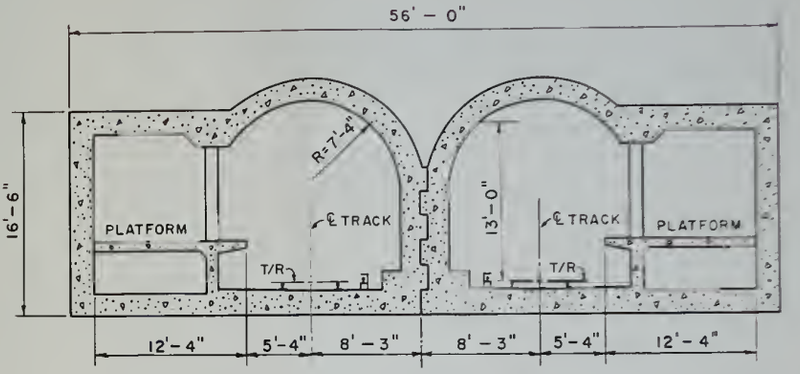
NICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
LITIES ENGINEERING BUREAU FEBRUARY 1960



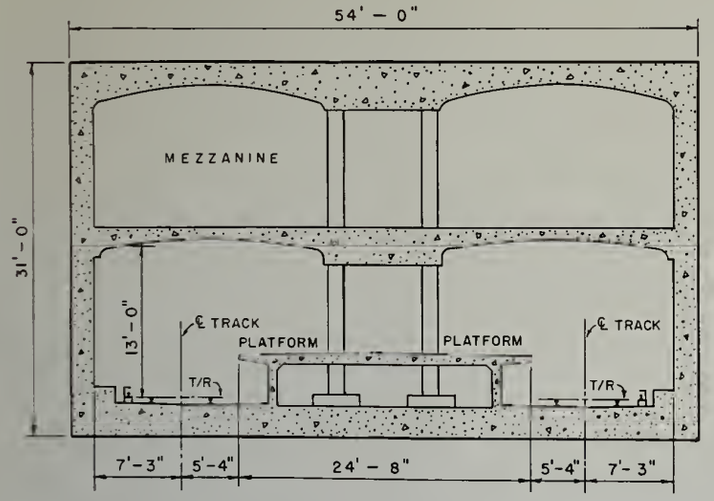
SIDE PLATFORM STATION — CUT AND COVER



CUT AND COVER
BETWEEN STATIONS

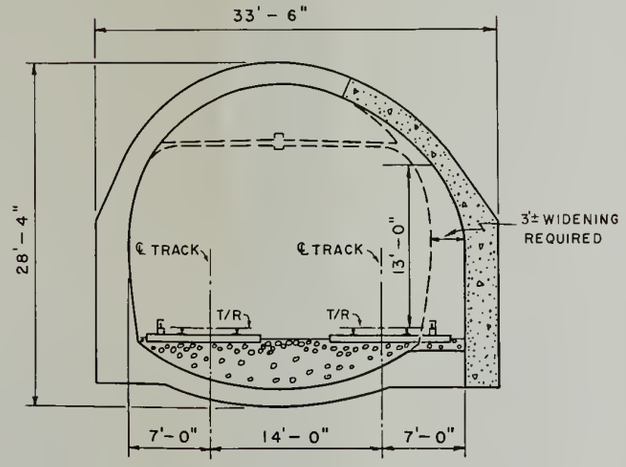


TUNNEL STATION



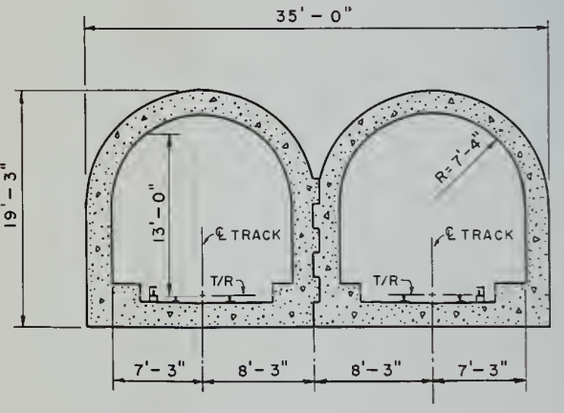
CENTER PLATFORM STATION — CUT AND COVER

NOTE:
T/R — TOP OF RAIL



TWIN PEAKS TUNNEL
WIDENING

(REQUIRED IN CASE CARS WIDER THAN 9 FEET ARE SELECTED.)

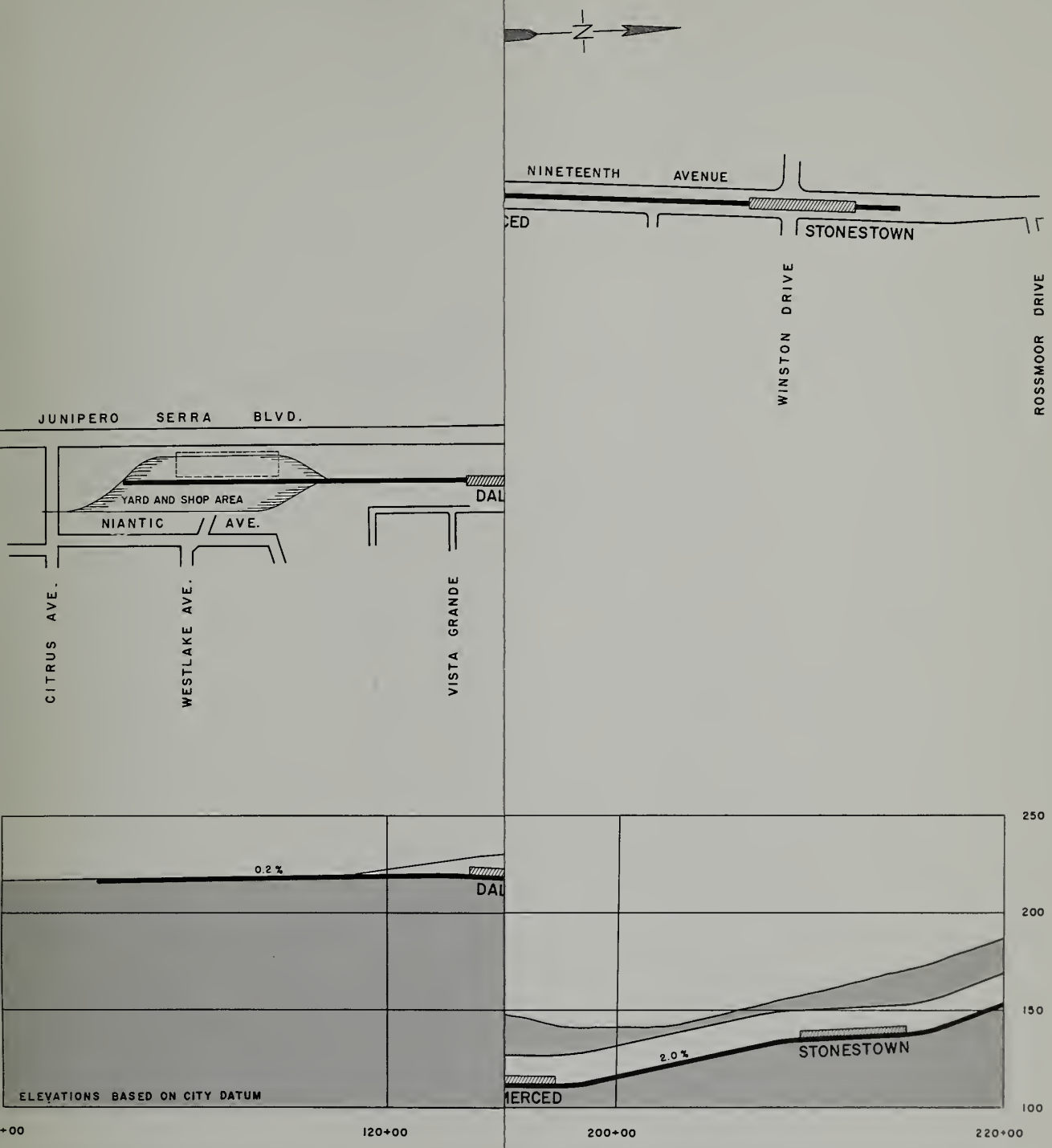


TUNNEL
BETWEEN STATIONS

(ALTERNATE SECTIONS FOR TUNNEL CONSTRUCTION MAY BE FOUND MORE ECONOMICAL AFTER DETAILED EXPLORATION. PRELIMINARY ESTIMATES BASED ON THESE SECTIONS.)

TYPICAL SUBWAY SECTIONS

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

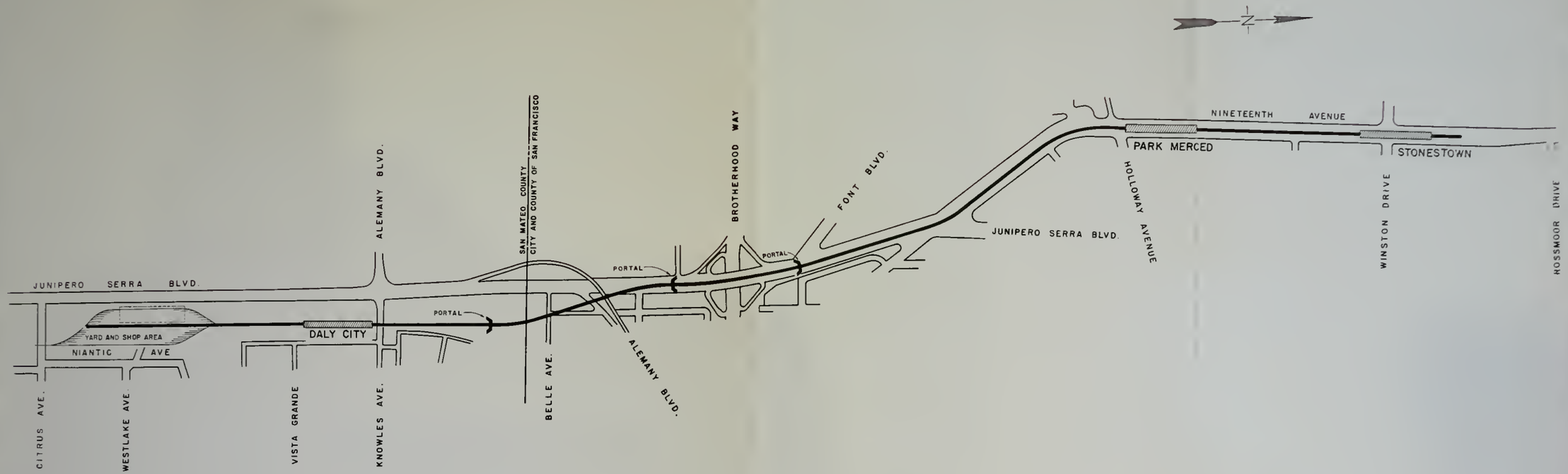
PLAN AND PROFILE

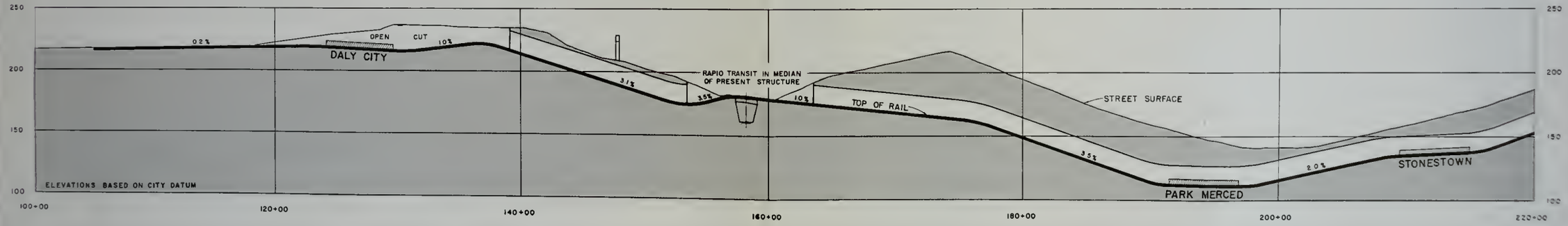
TWIN PEAKS ROUTE

DALY CITY TO ROSSMOOR DRIVE

CAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

ITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

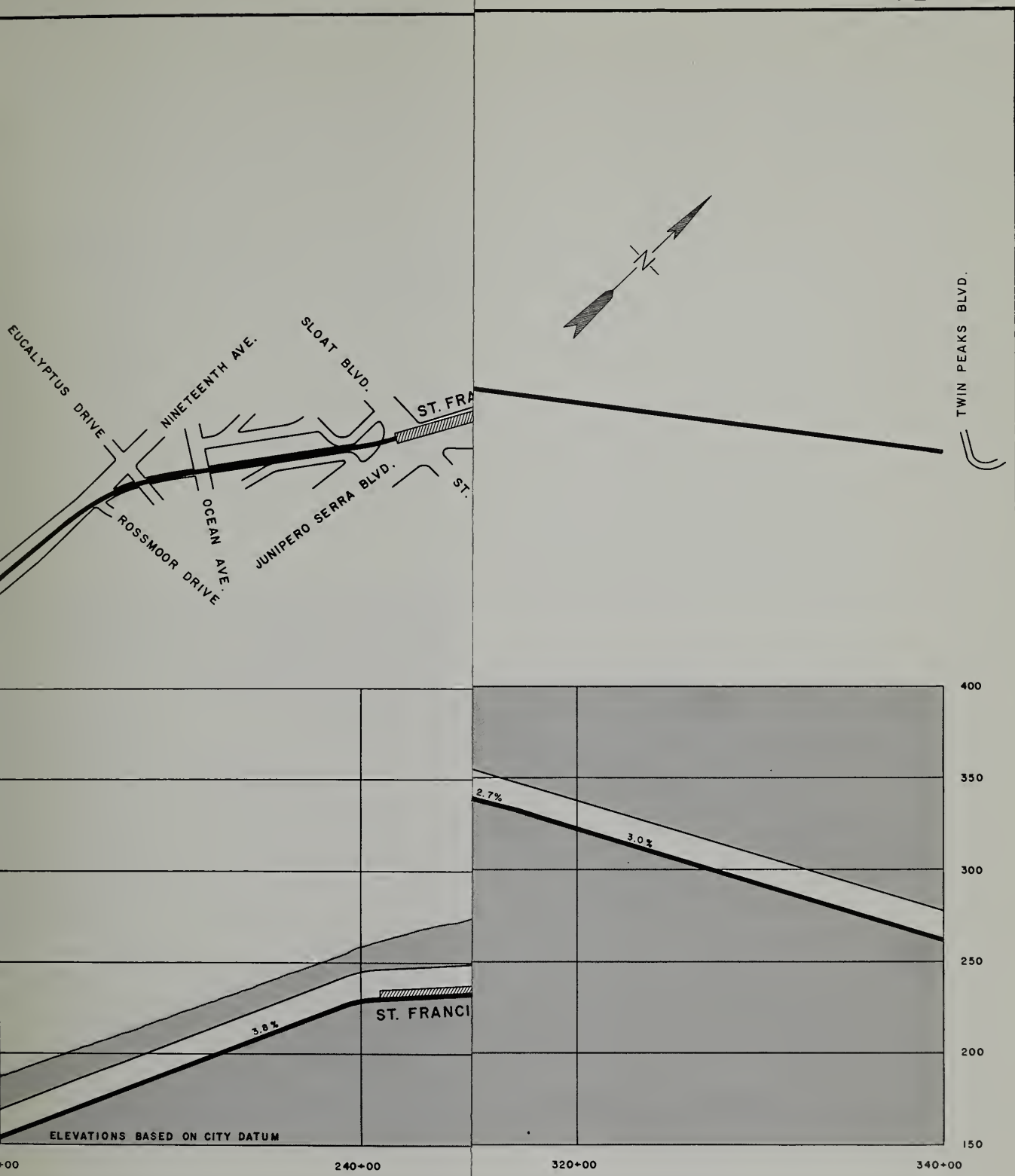
PLAN AND PROFILE

TWIN PEAKS ROUTE

DALY CITY TO ROSSMOOR DRIVE

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960



SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

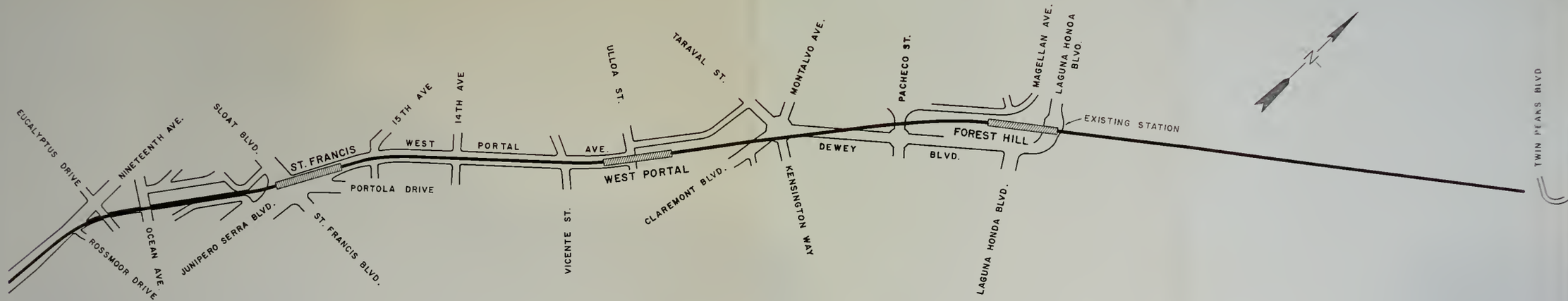
PLAN AND PROFILE

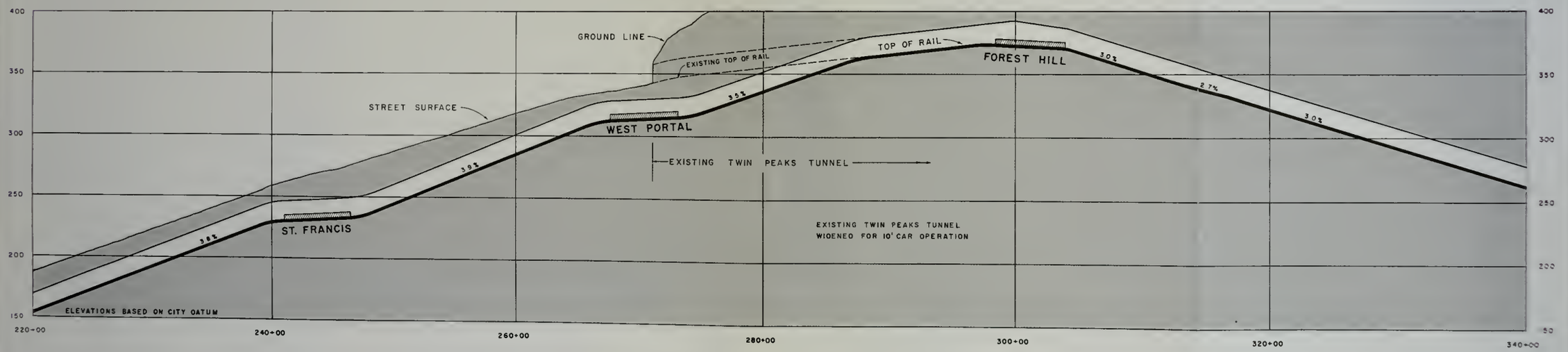
TWIN PEAKS ROUTE

SMOOR DRIVE TO TWIN PEAKS BOULEVARD

CAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

ITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 600 1200 FEET

VERTICAL 0 20 40 80 120 FEET

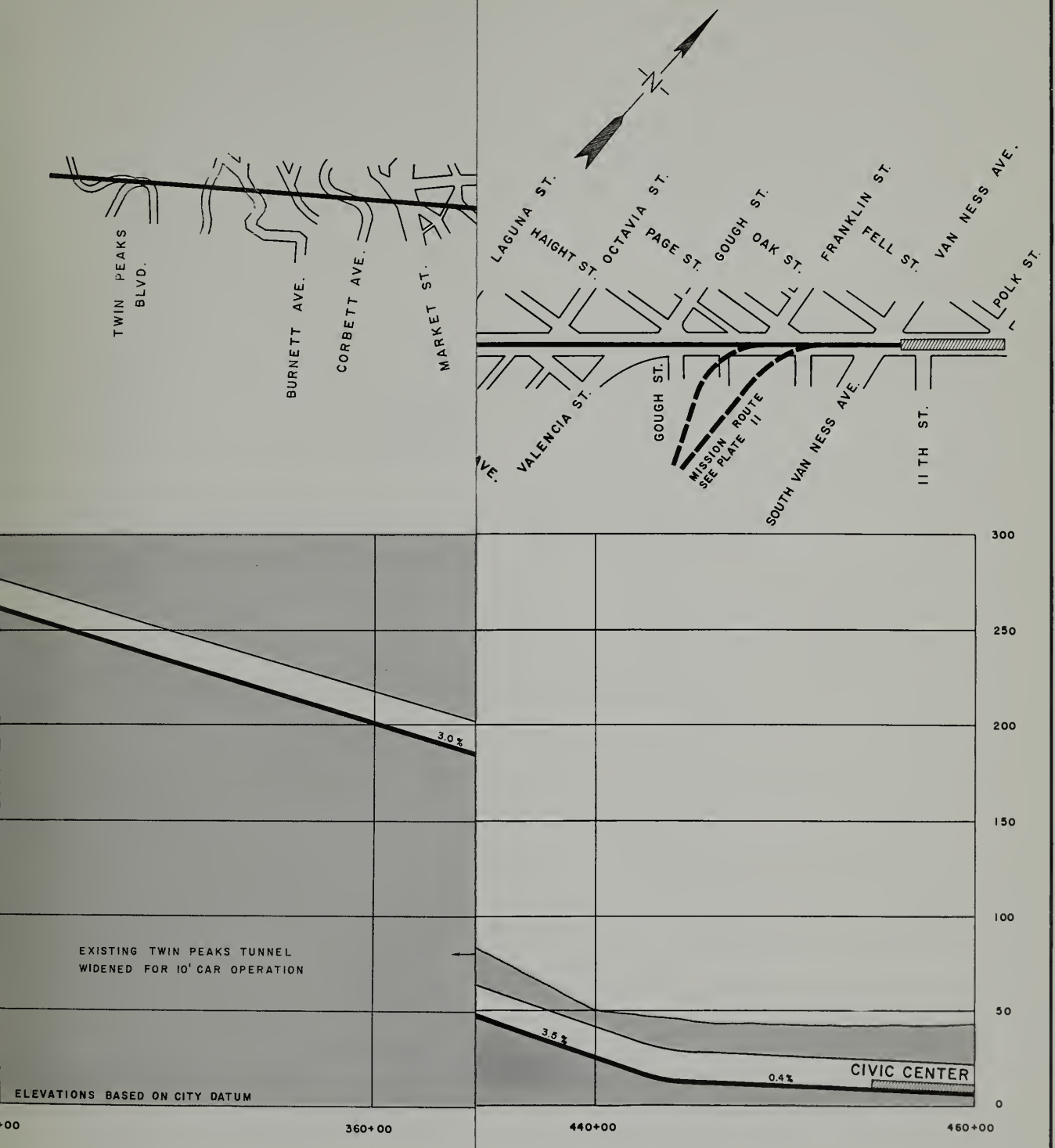
PLAN AND PROFILE

TWIN PEAKS ROUTE

ROSSMOOR DRIVE TO TWIN PEAKS BOULEVARD

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960



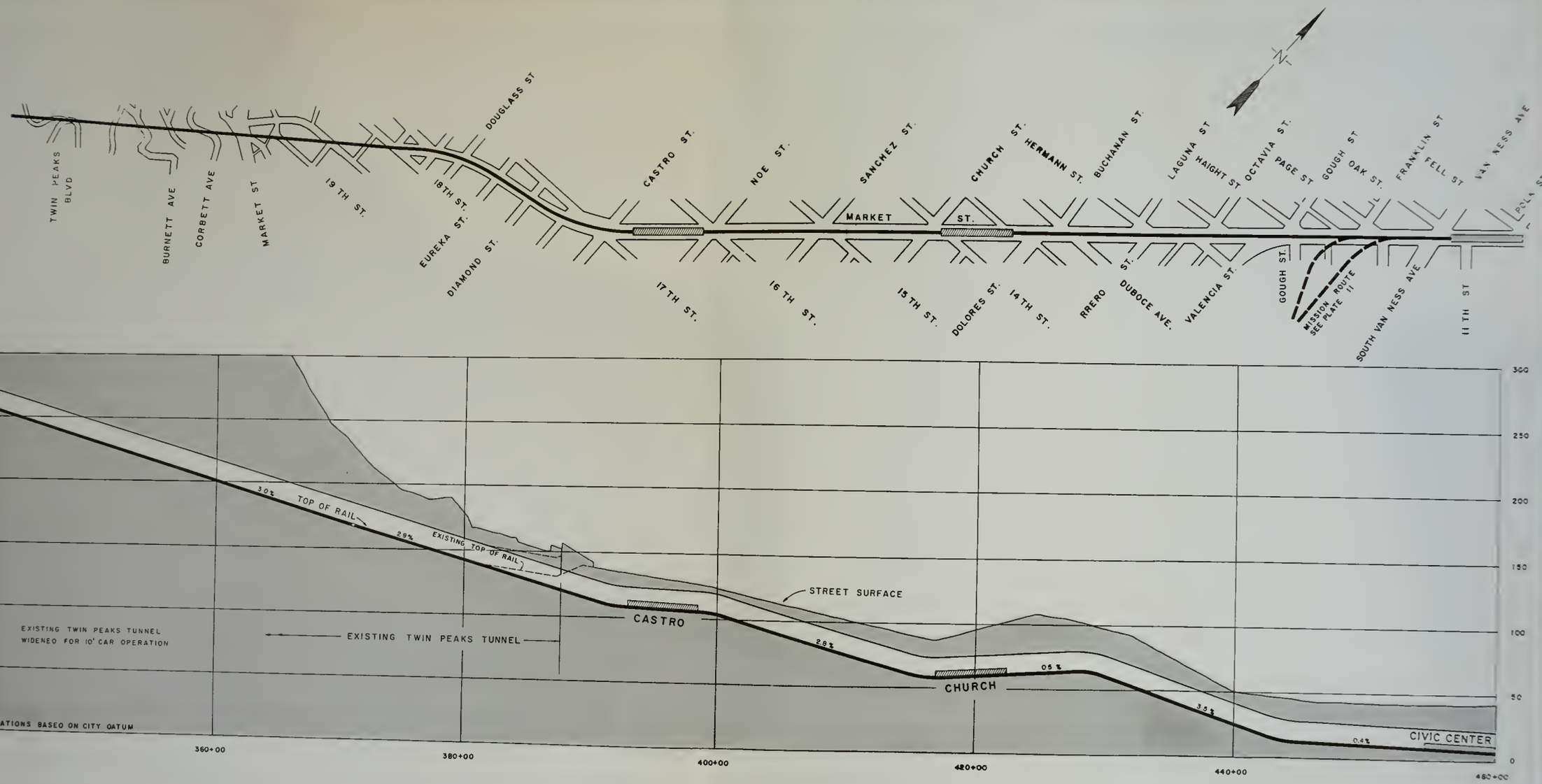
PLAN AND PROFILE

TWIN PEAKS ROUTE

WIN PEAKS BOULEVARD TO POLK STREET

NICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

LITIES ENGINEERING BUREAU FEBRUARY 1960



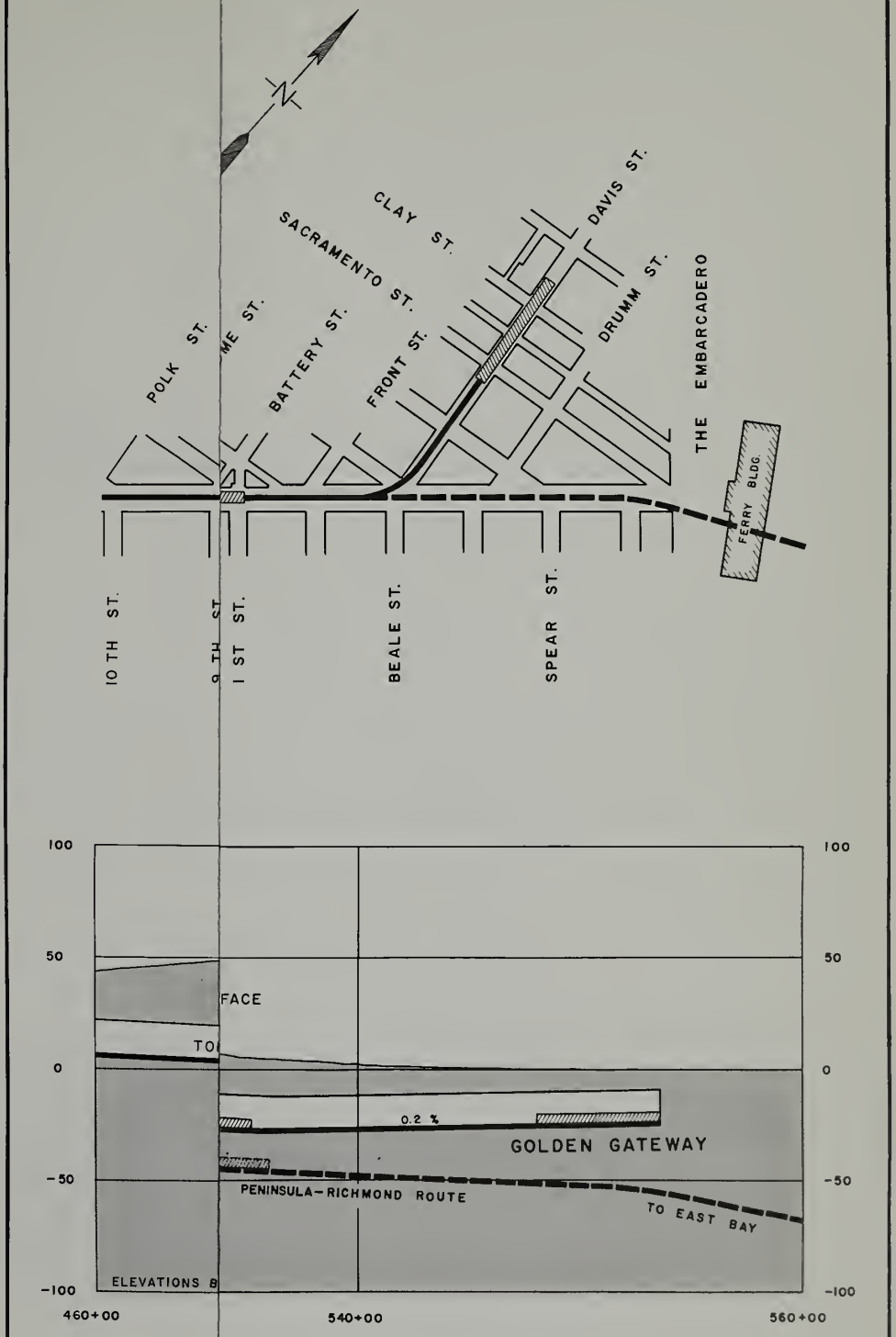
PLAN AND PROFILE

TWIN PEAKS ROUTE

TWIN PEAKS BOULEVARD TO POLK STREET

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960

PLATE 7



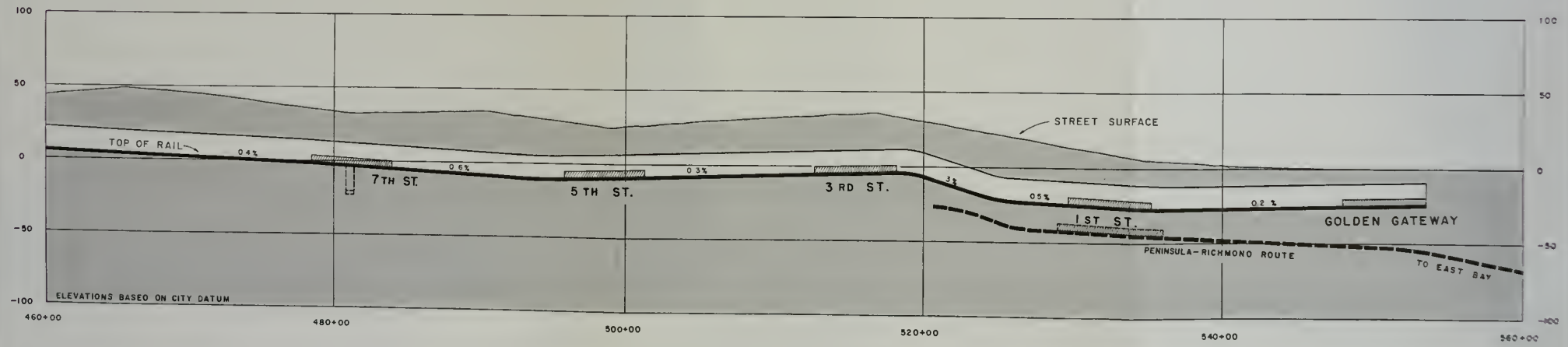
PLAN AND PROFILE

TWIN PEAKS ROUTE

LK STREET TO DAVIS AND CLAY STREETS

ICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

LITIES ENGINEERING BUREAU FEBRUARY 1960



SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

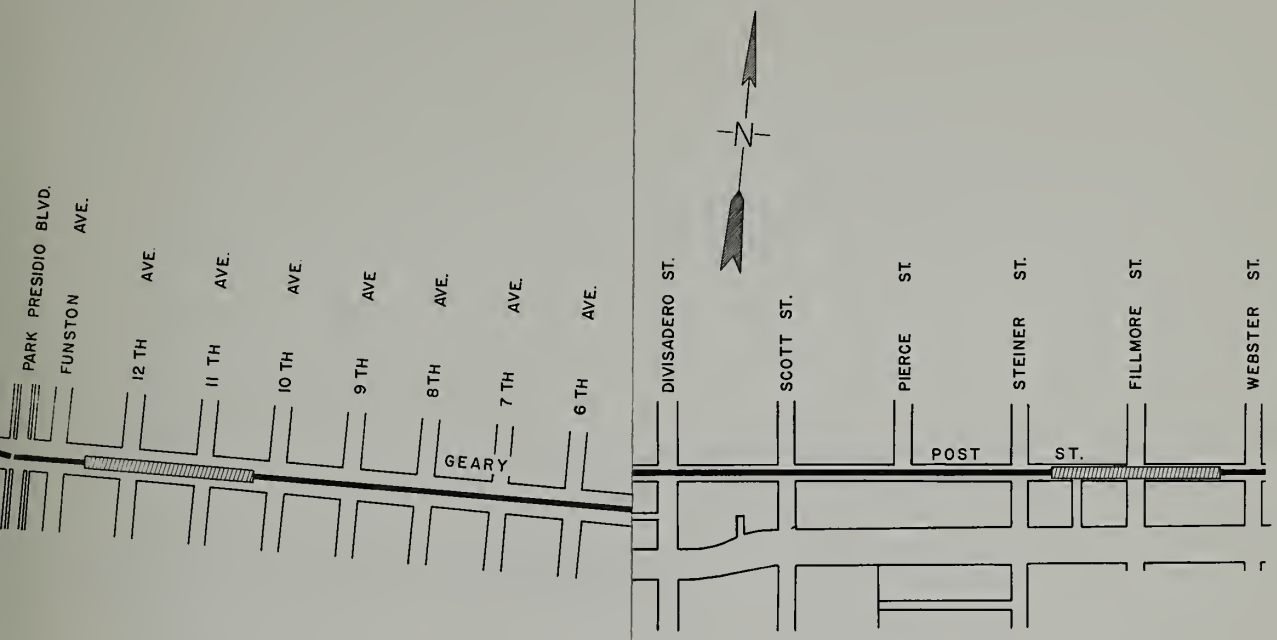
PLAN AND PROFILE

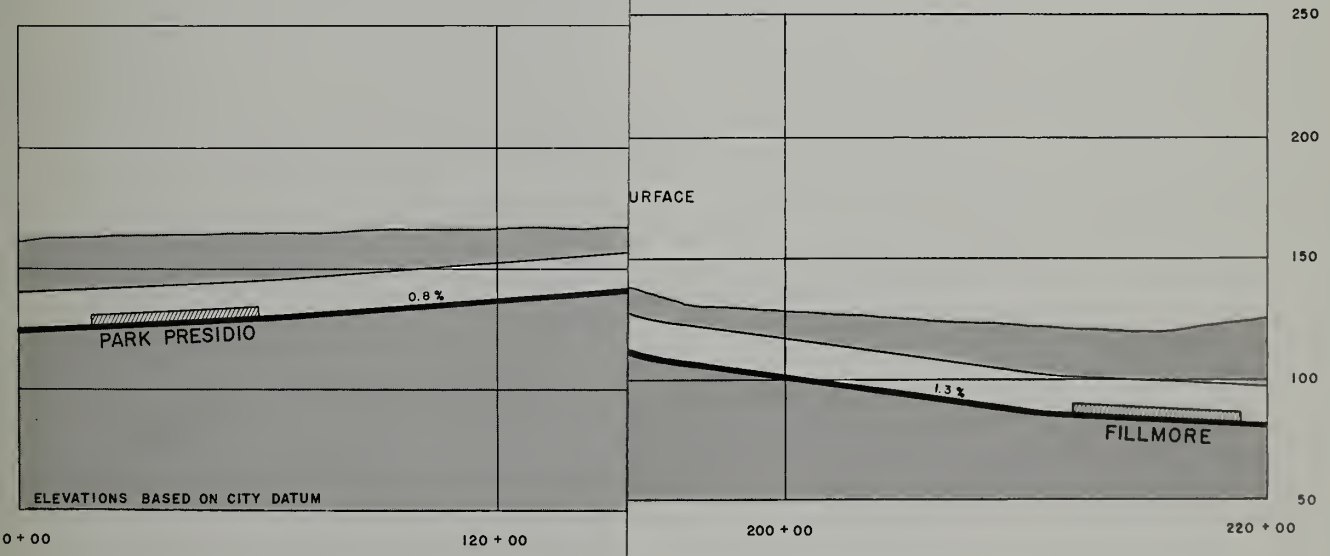
TWIN PEAKS ROUTE

POLK STREET TO DAVIS AND CLAY STREETS

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

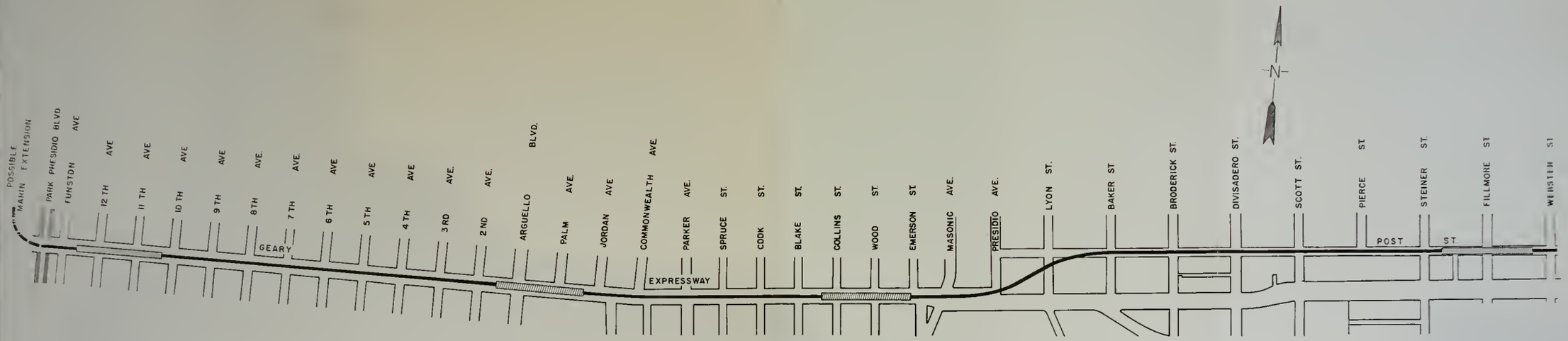
PLAN AND PROFILE

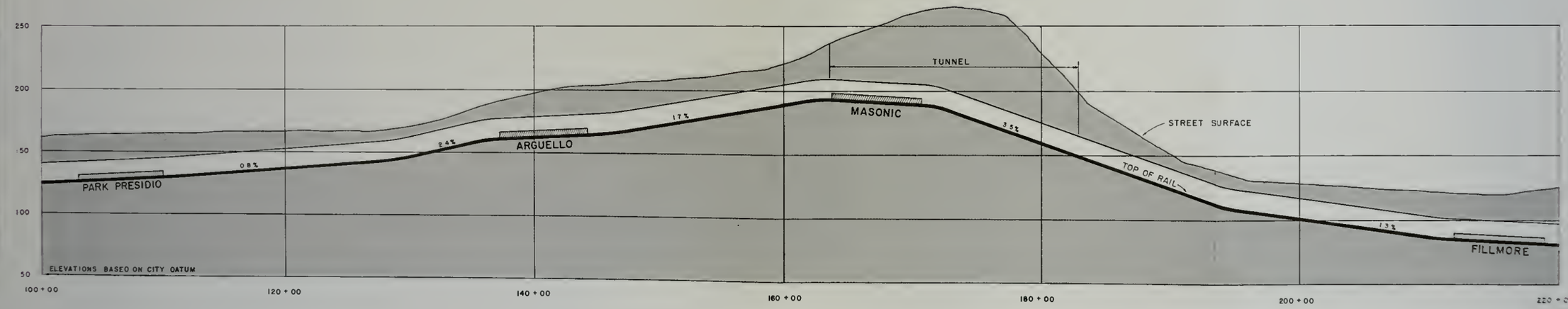
RICHMOND ROUTE

RK PRESIDIO BOULEVARD TO WEBSTER STREET

NICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

ILITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

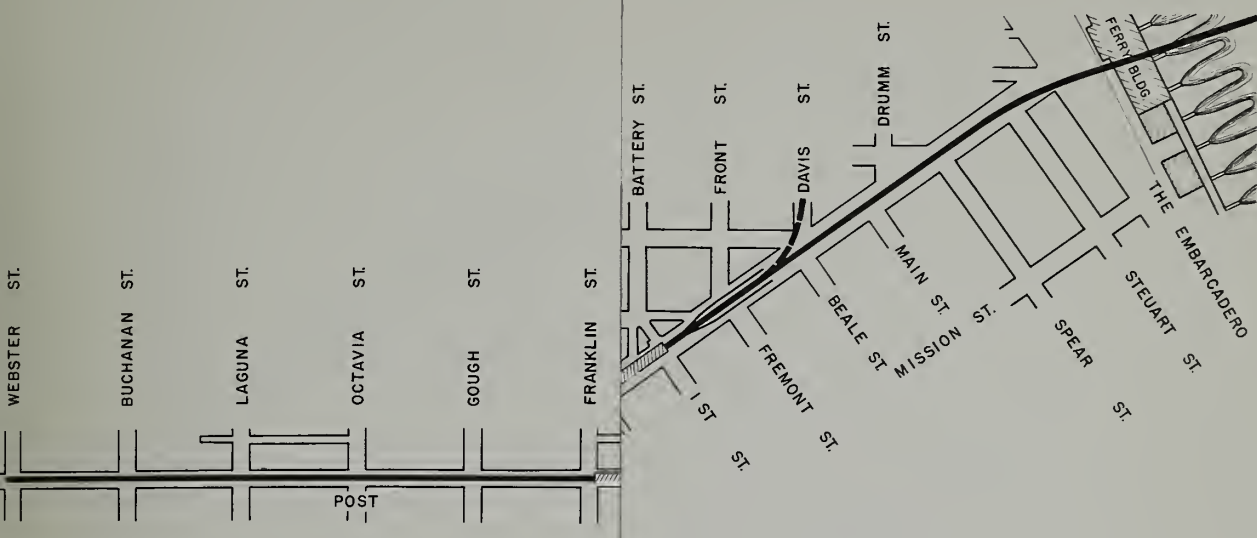
VERTICAL 0 20 40 80 120 FEET

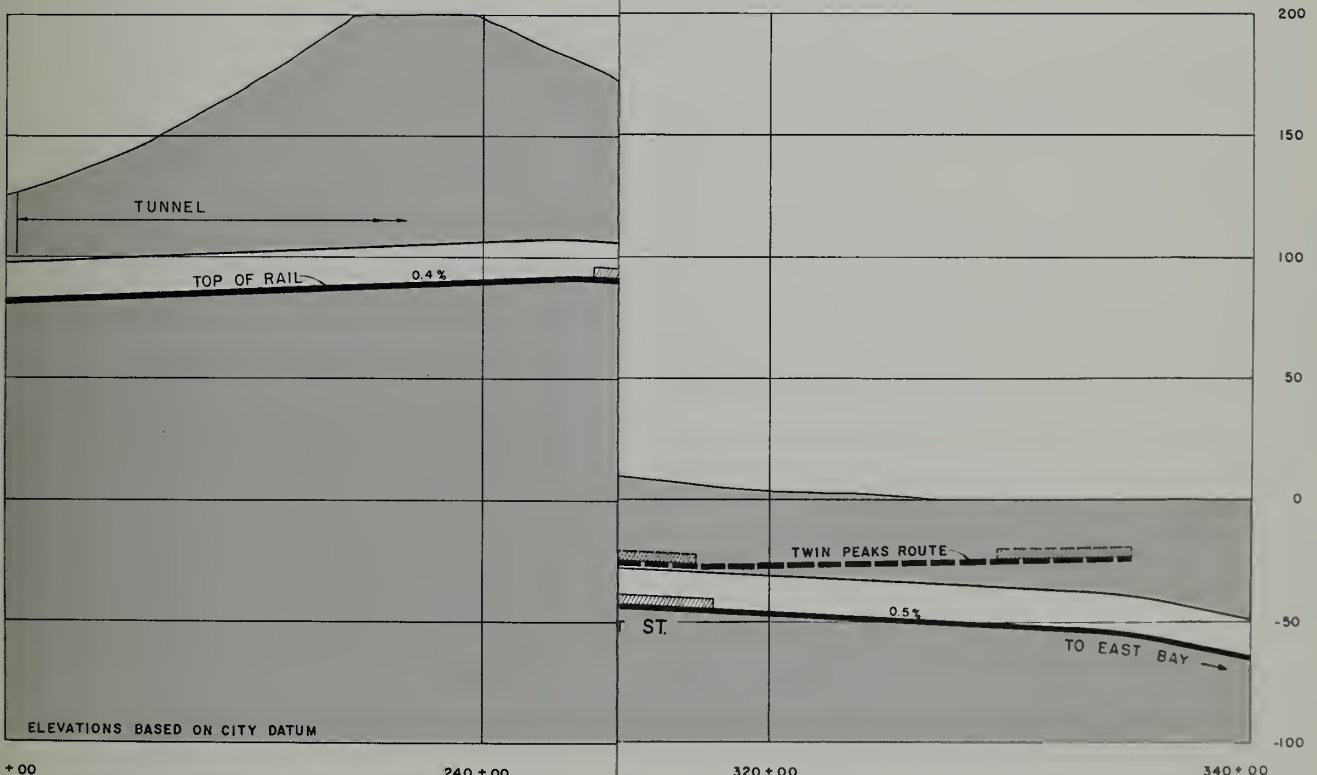
PLAN AND PROFILE

RICHMOND ROUTE

PARK PRESIDIO BOULEVARD TO WEBSTER STREET

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

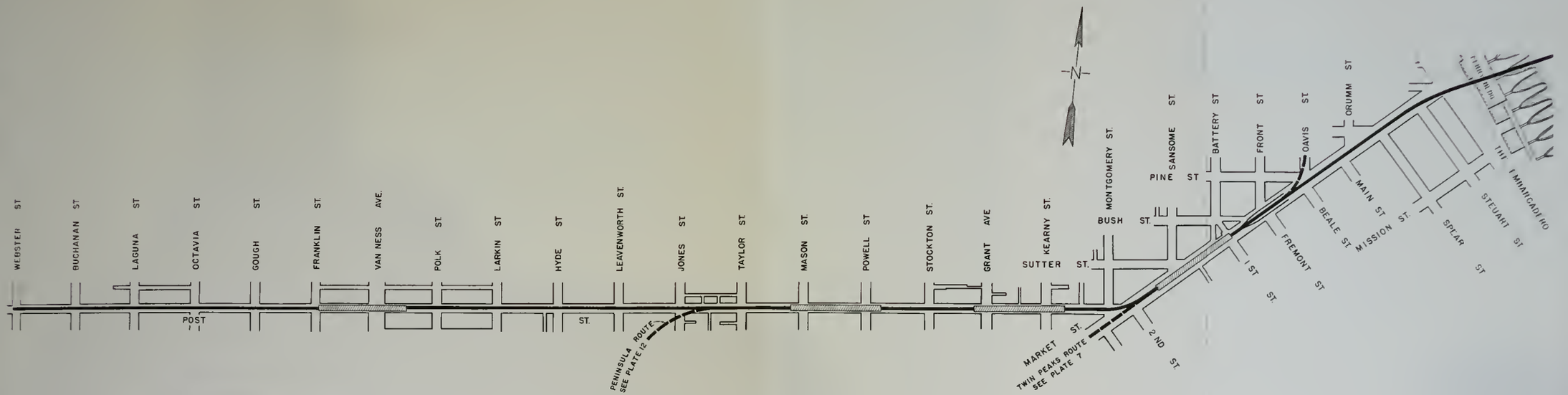
PLAN AND PROFILE

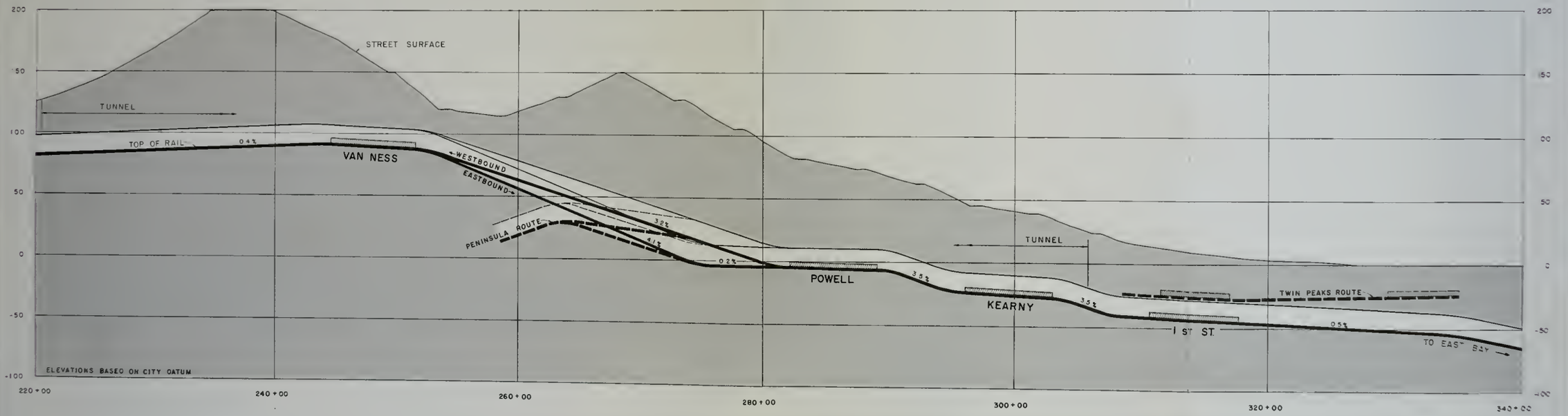
RICHMOND ROUTE

STER STREET TO FIRST AND MARKET STREETS

ICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

LITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

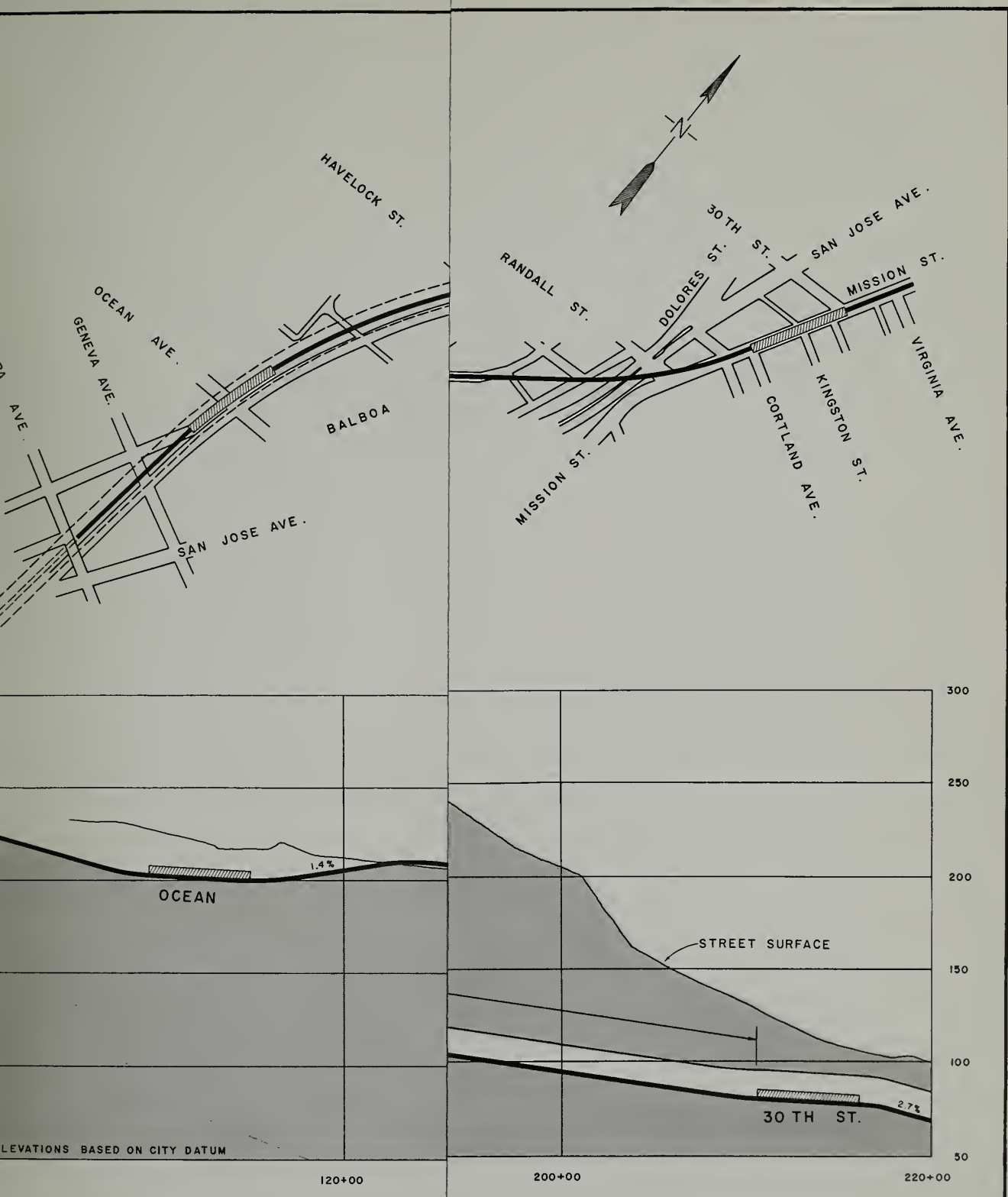
PLAN AND PROFILE

RICHMOND ROUTE

WEBSTER STREET TO FIRST AND MARKET STREETS

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960



SCALES

ZONTAL 0 200 400 800 1200 FEET

TICAL 0 20 40 80 120 FEET

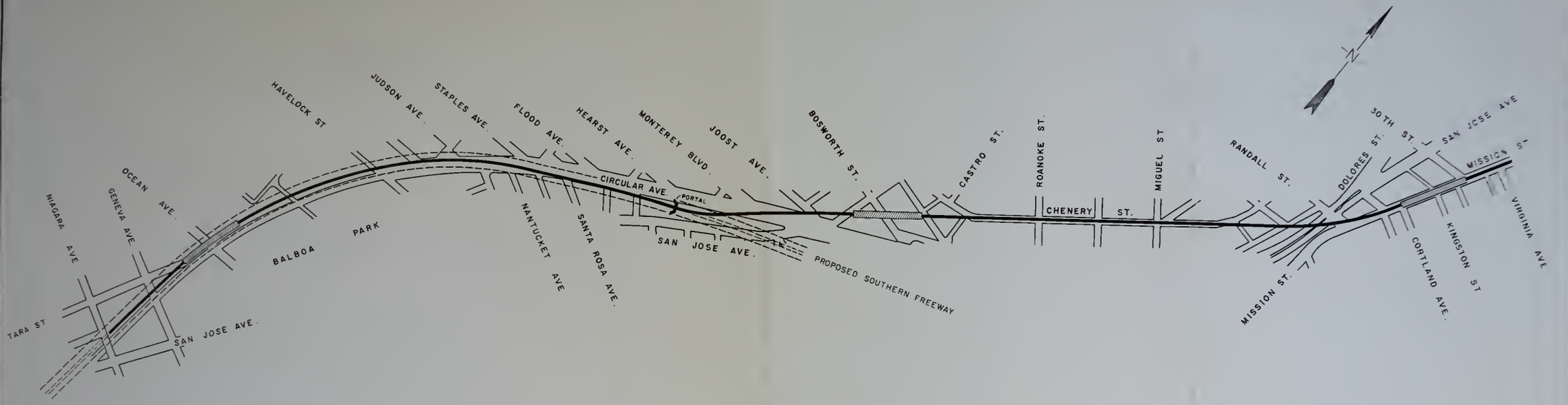
PLAN AND PROFILE

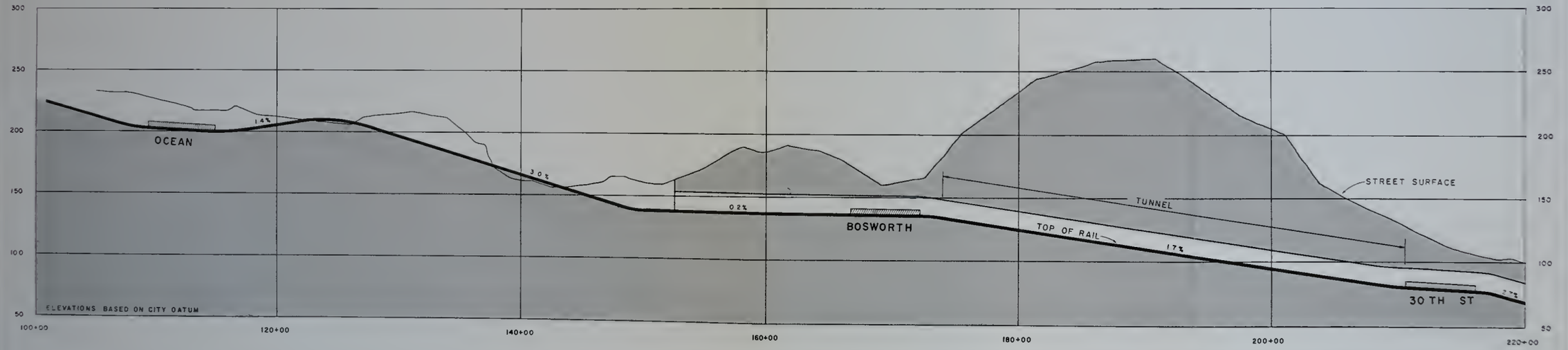
MISSION ROUTE

OCEAN AVENUE TO VIRGINIA AVENUE

ICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

LITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

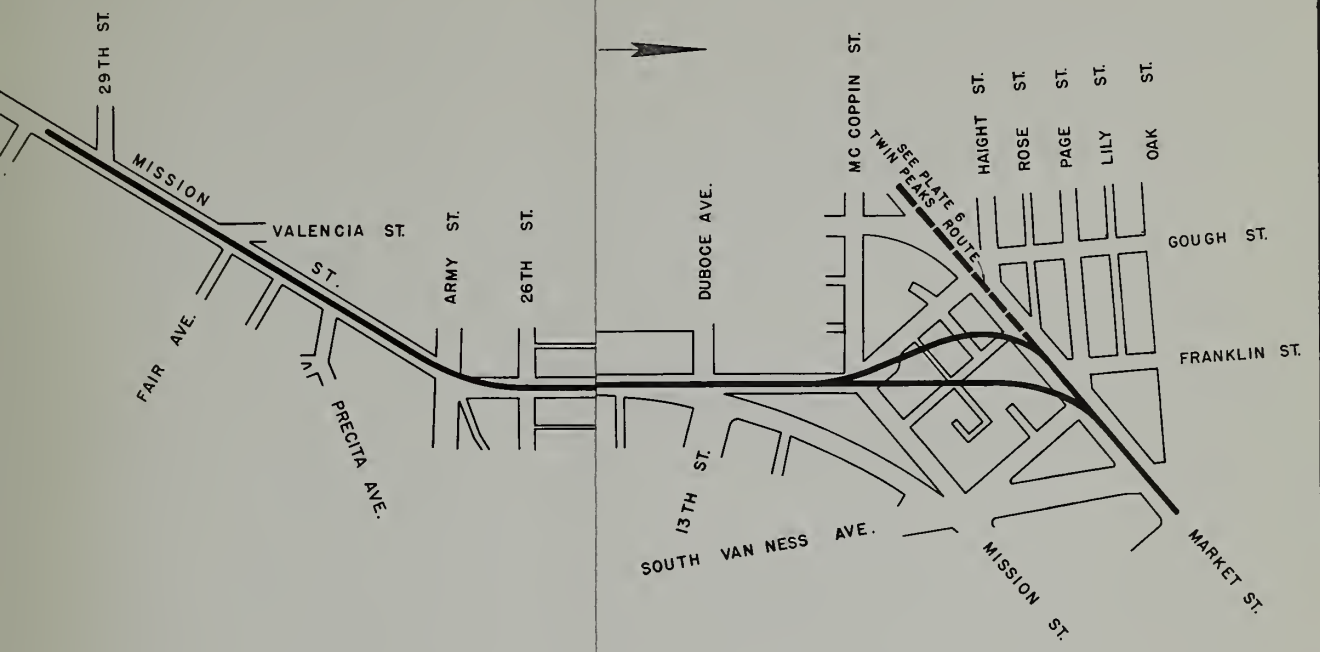
PLAN AND PROFILE

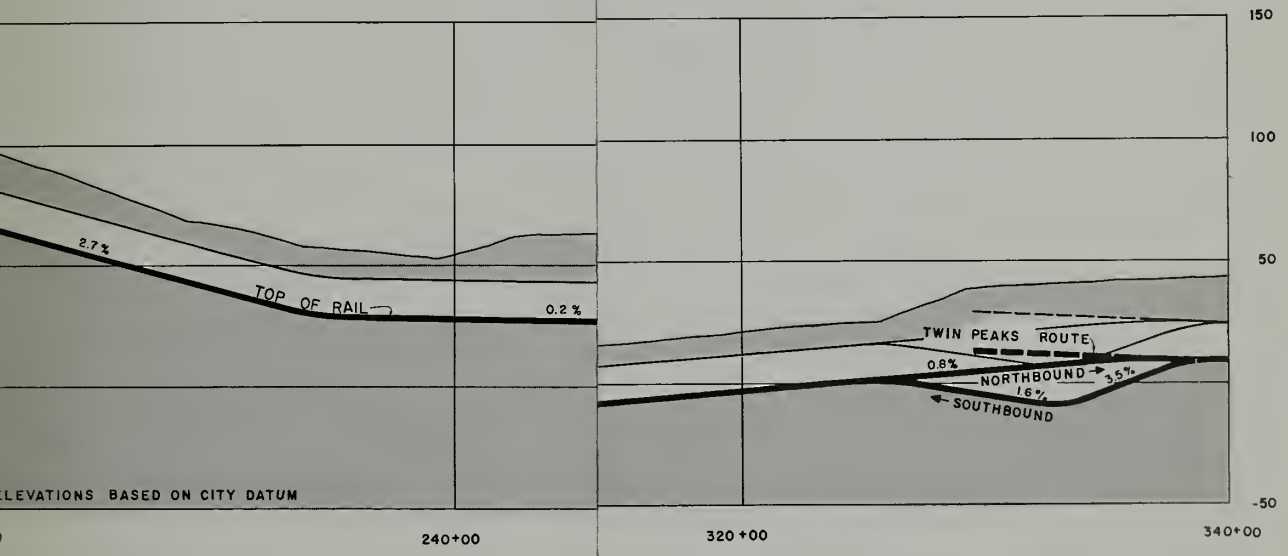
MISSION ROUTE

OCEAN AVENUE TO VIRGINIA AVENUE

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

ZONTAL 0 200 400 800 1200 FEET

TICAL 0 20 40 80 120 FEET

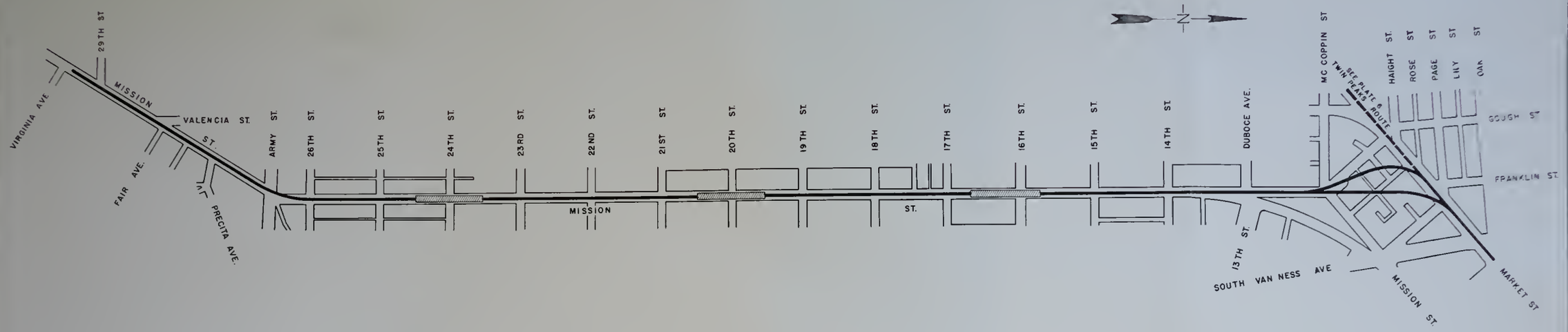
PLAN AND PROFILE

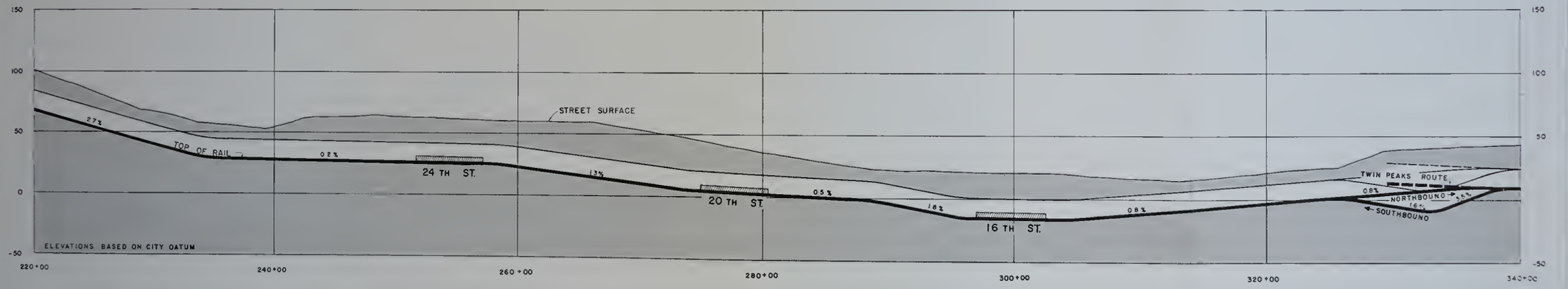
MISSION ROUTE

VIRGINIA AVENUE TO MARKET STREET

ICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

LITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

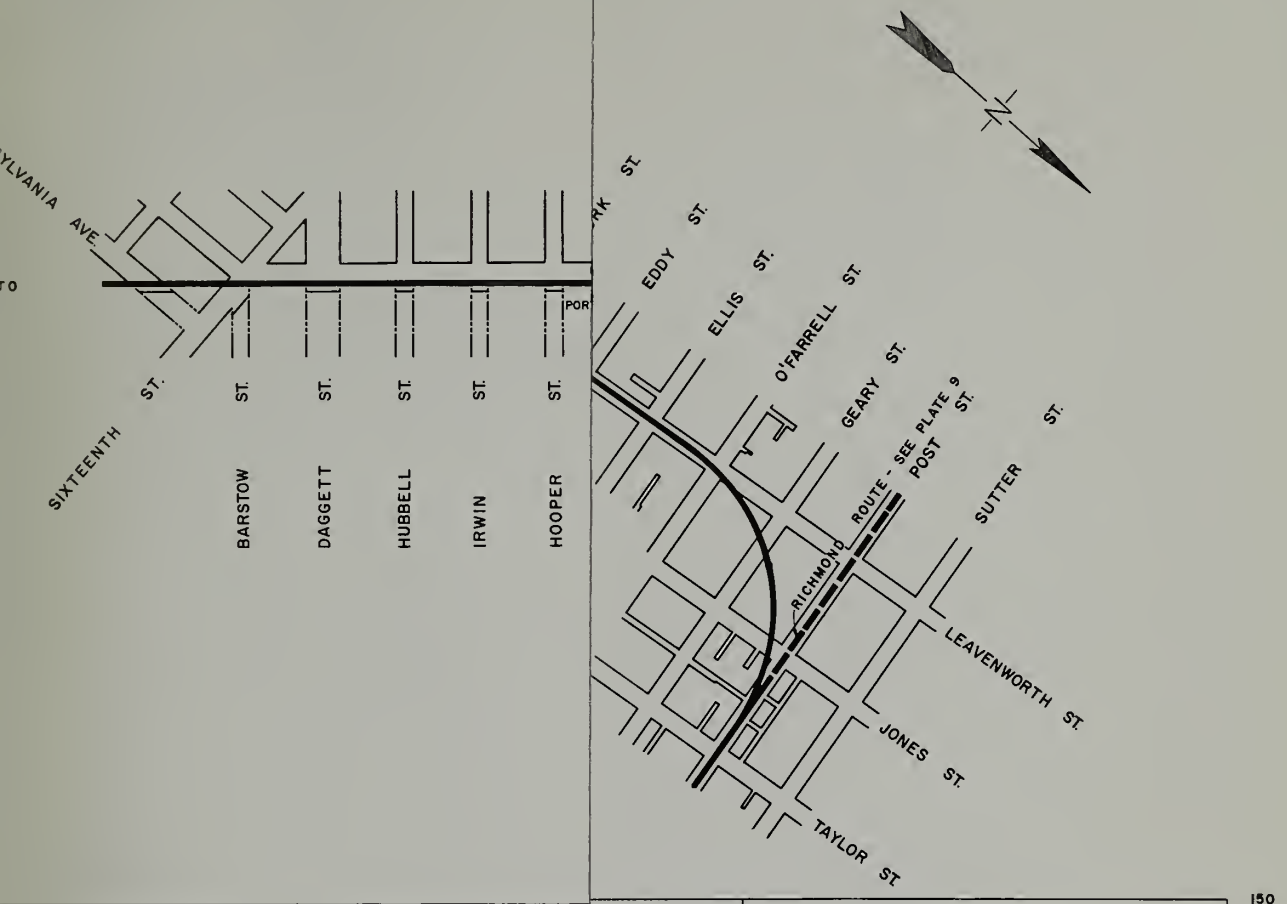
PLAN AND PROFILE

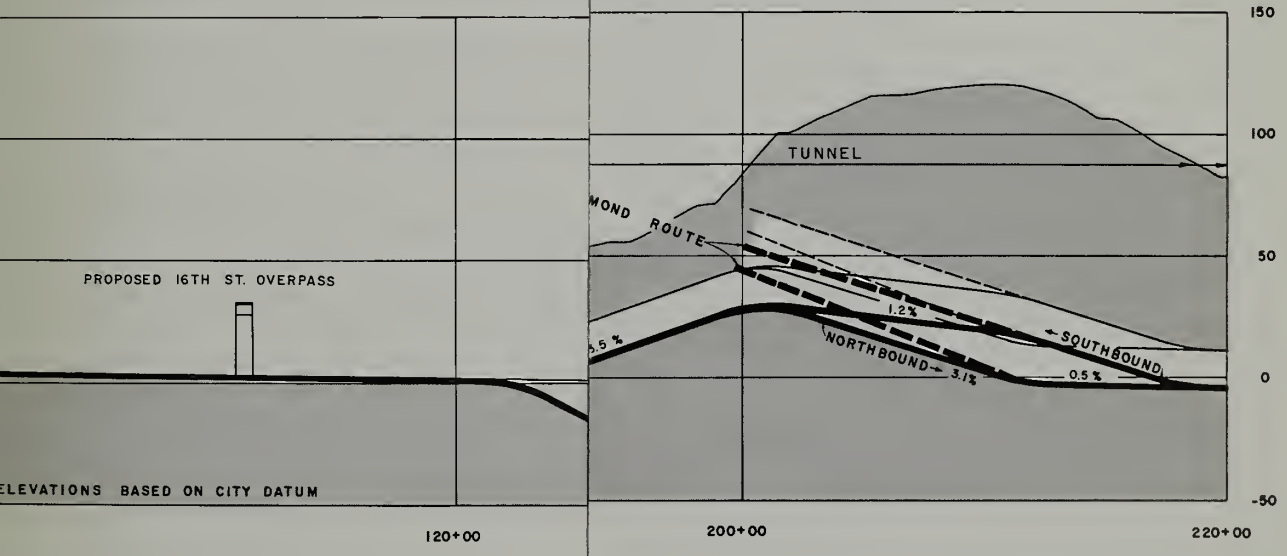
MISSION ROUTE

VIRGINIA AVENUE TO MARKET STREET

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

IZONTAL 0 200 400 800 1200 FEET

TICAL 0 20 40 80 120 FEET

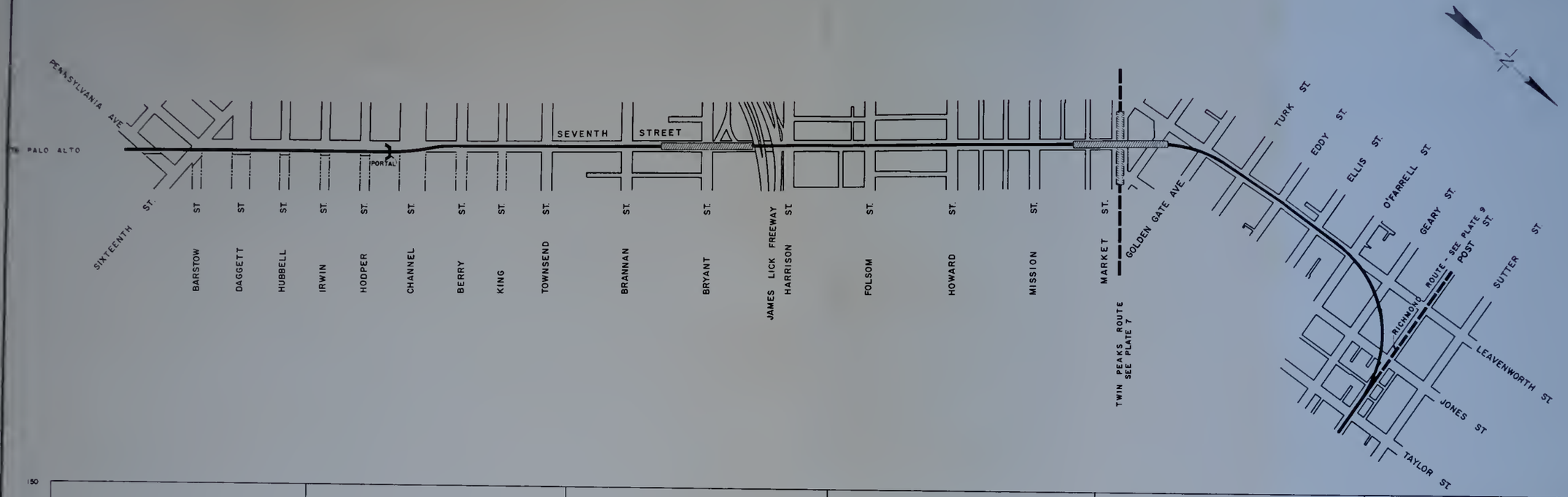
PLAN AND PROFILE

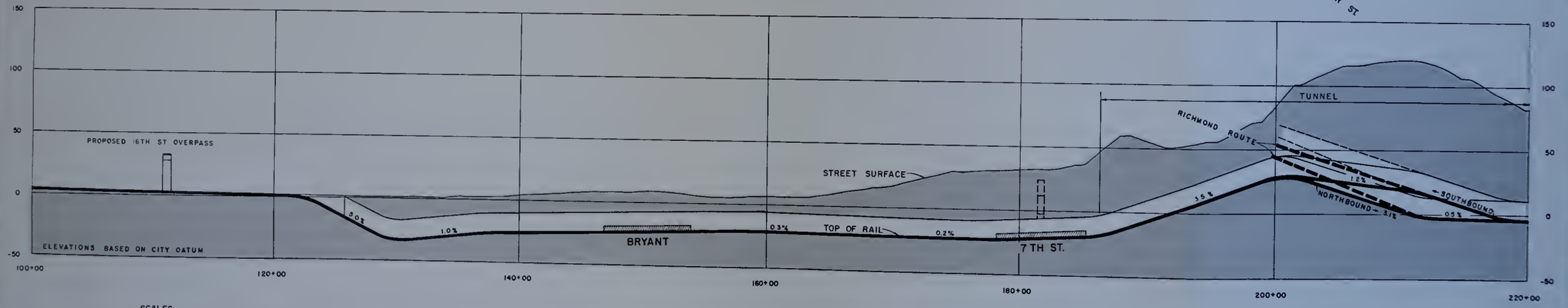
PENINSULA ROUTE

PENNSYLVANIA AVENUE TO POST STREET

NICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

LITIES ENGINEERING BUREAU FEBRUARY 1960





SCALES

HORIZONTAL 0 200 400 800 1200 FEET

VERTICAL 0 20 40 80 120 FEET

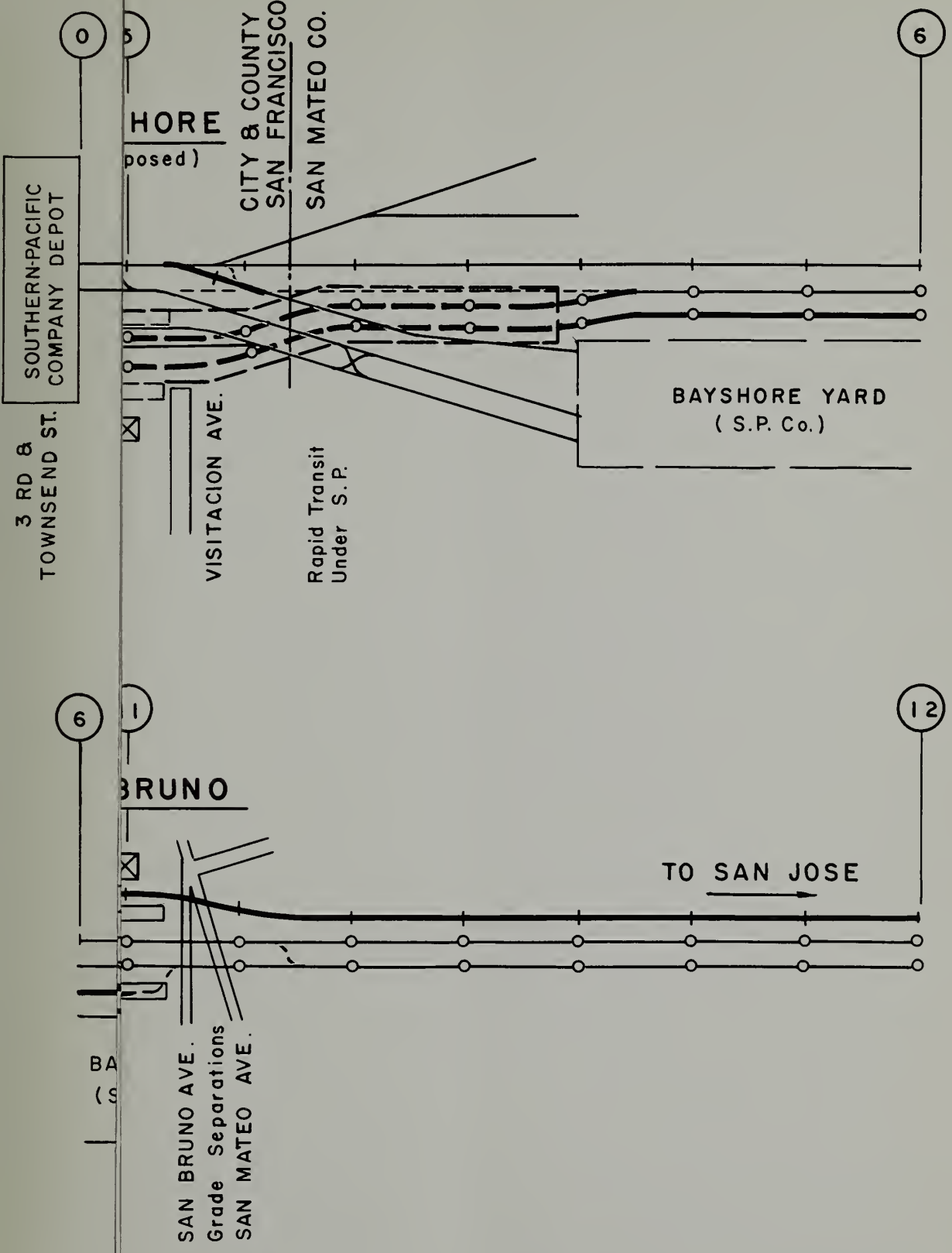
PLAN AND PROFILE

PENINSULA ROUTE

PENNSYLVANIA AVENUE TO POST STREET

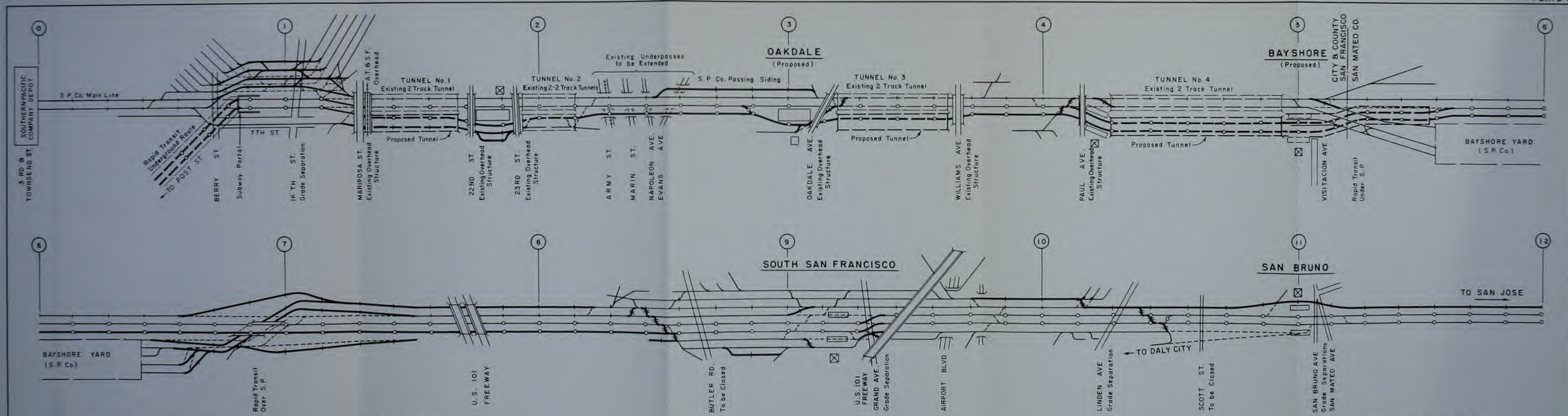
TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL

UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PENINSULA ROUTE
JOINT SOUTHERN PACIFIC – RAPID TRANSIT FACILITIES
SAN FRANCISCO TO SAN BRUNO

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960

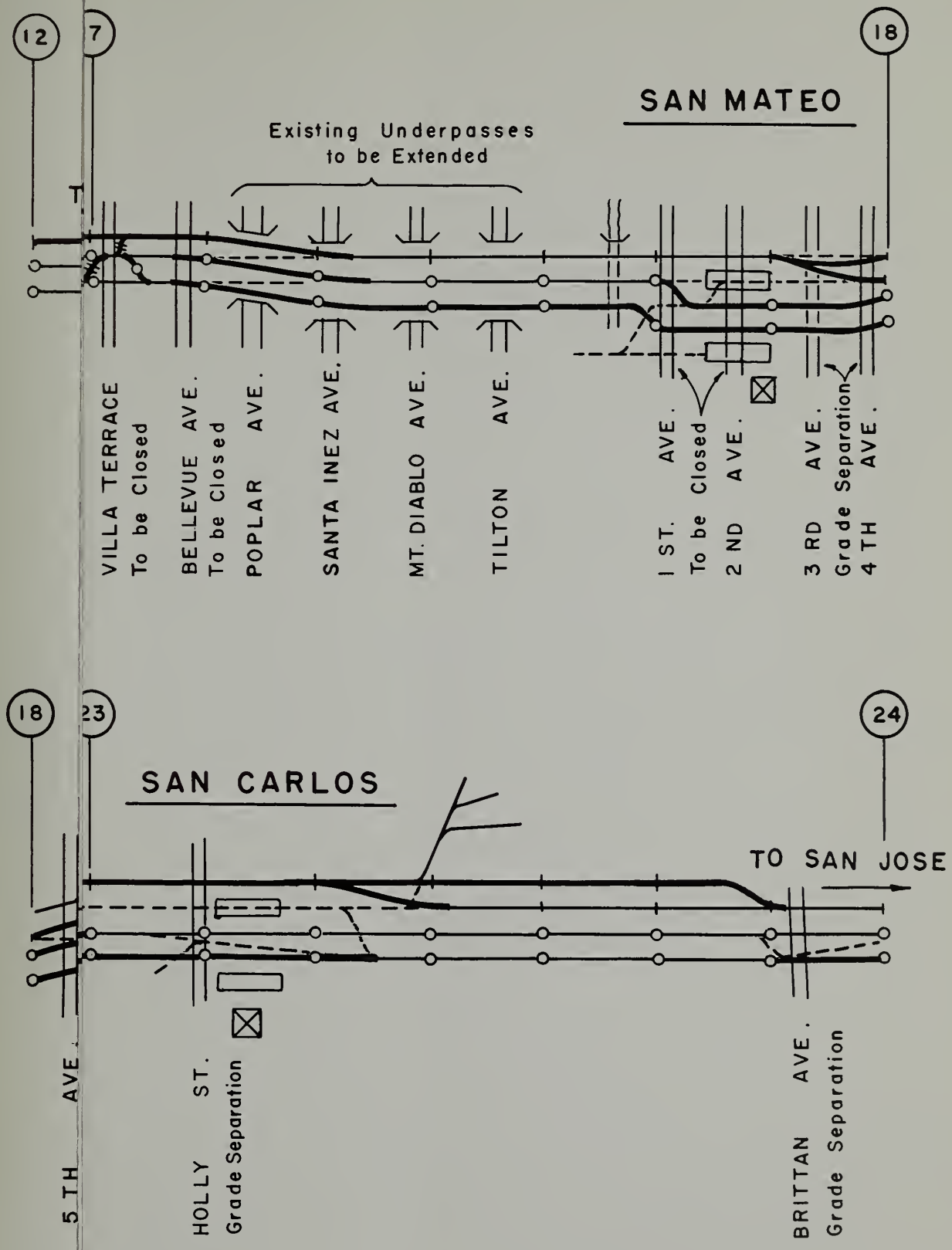


PENINSULA ROUTE

JOINT SOUTHERN PACIFIC – RAPID TRANSIT FACILITIES

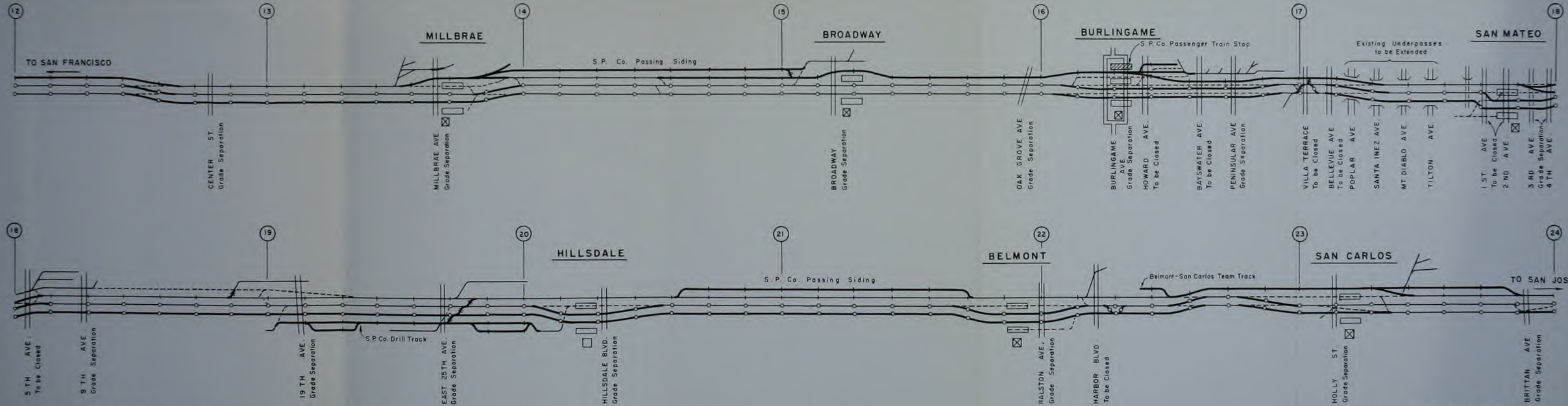
SAN FRANCISCO TO SAN BRUNO

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PENINSULA ROUTE
JOINT SOUTHERN PACIFIC – RAPID TRANSIT FACILITIES
SAN BRUNO TO SAN CARLOS

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PENINSULA ROUTE
JOINT SOUTHERN PACIFIC – RAPID TRANSIT FACILITIES
SAN BRUNO TO SAN CARLOS

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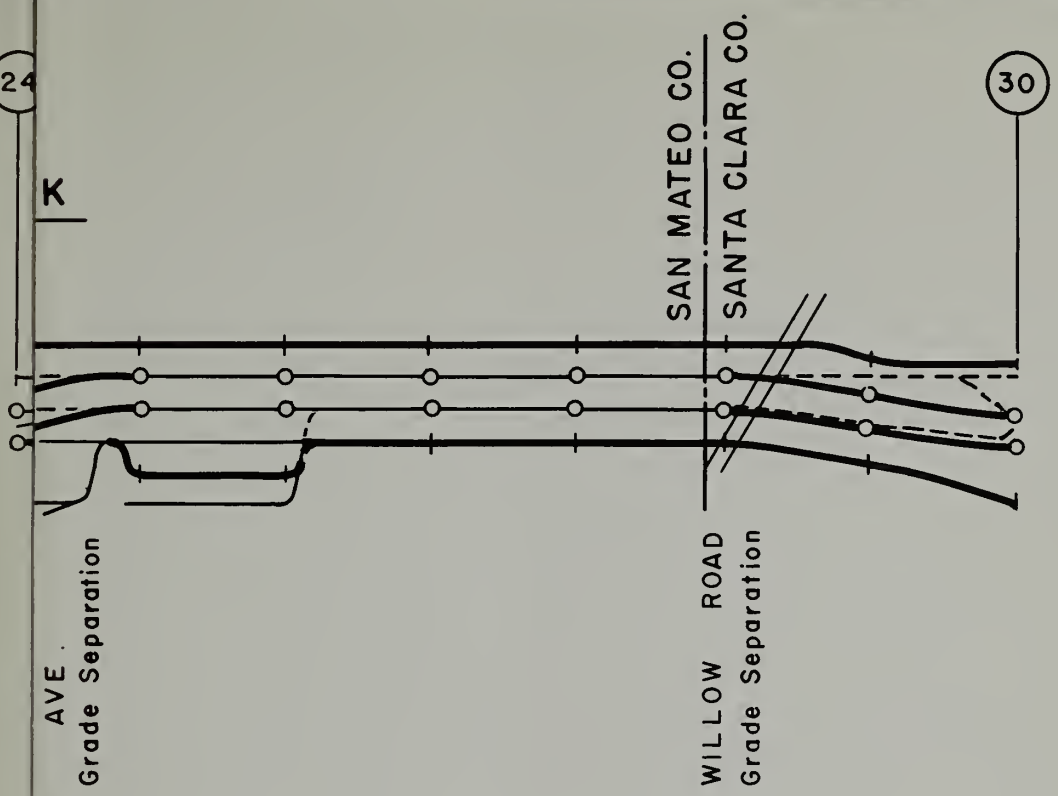
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



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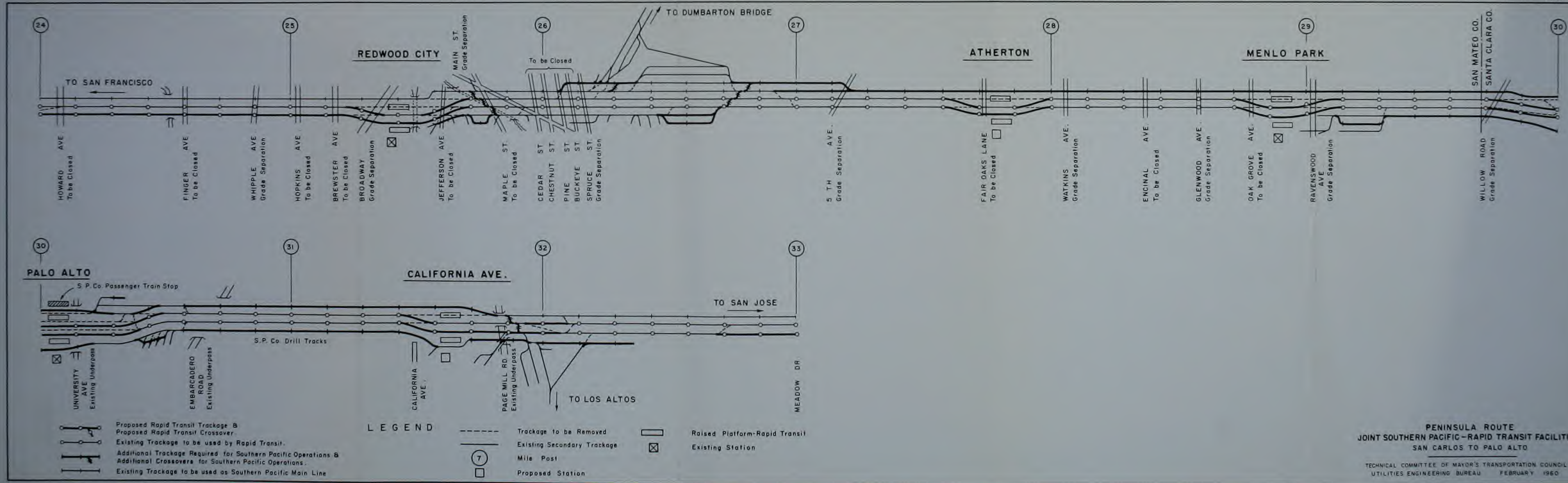
PAL

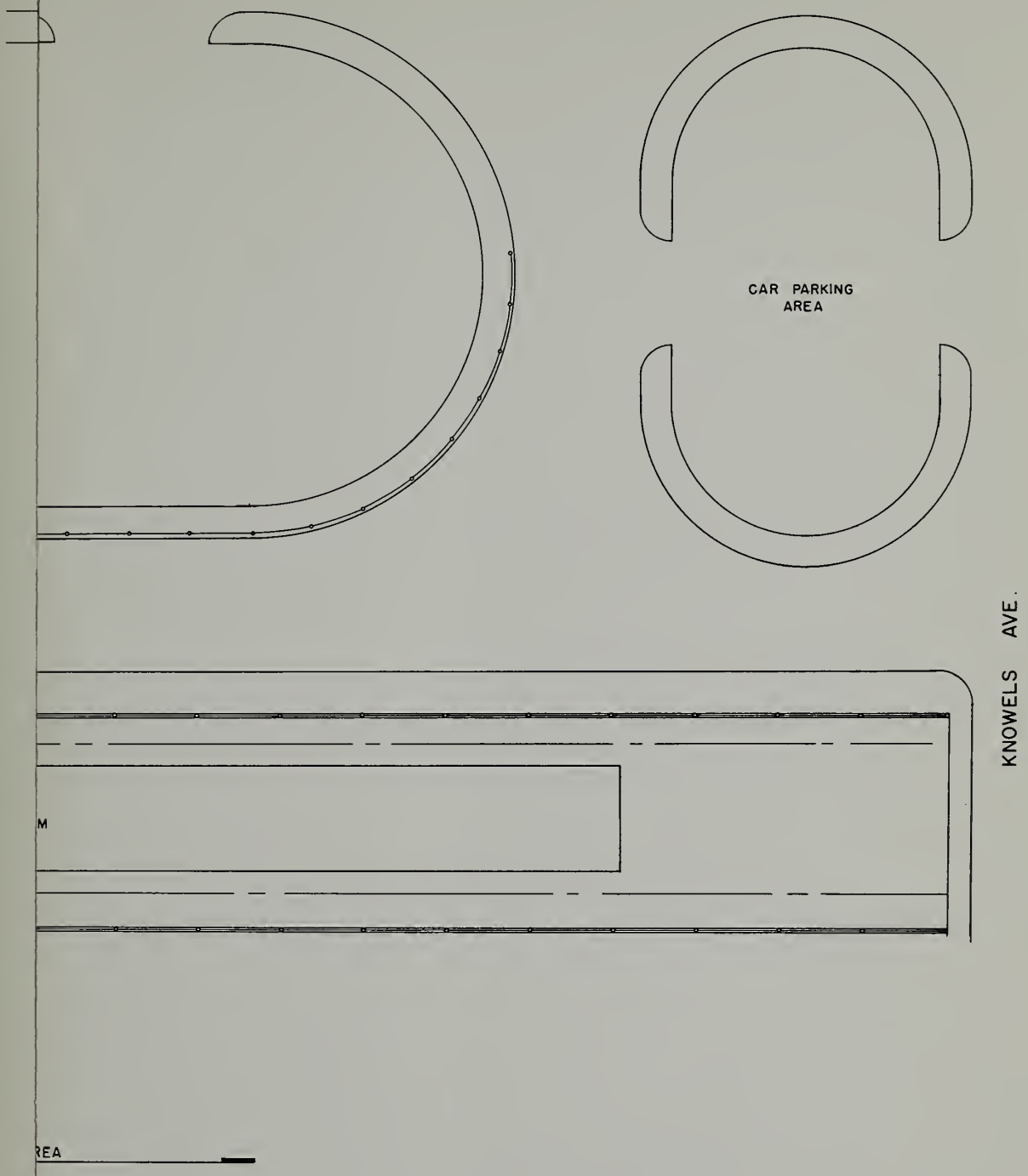
PENINSULA ROUTE
JOINT SOUTHERN PACIFIC – RAPID TRANSIT FACILITIES
SAN CARLOS TO PALO ALTO

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



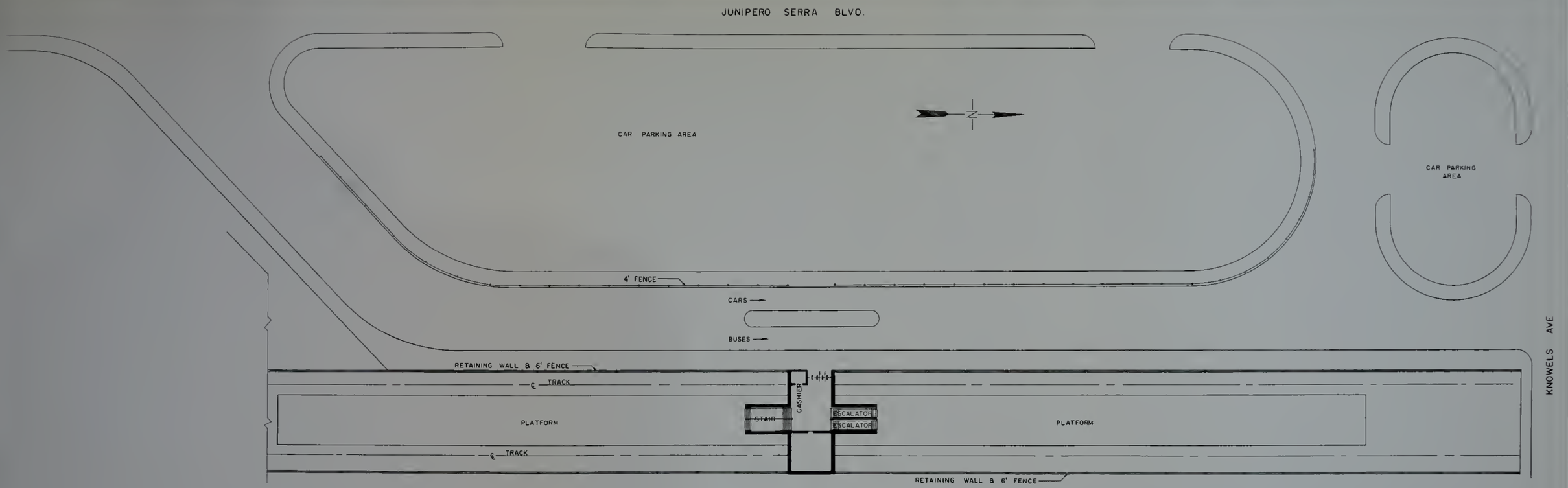
PENINSULA ROUTE
JOINT SOUTHERN PACIFIC–RAPID TRANSIT FACILITIES
SAN CARLOS TO PALO ALTO

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960

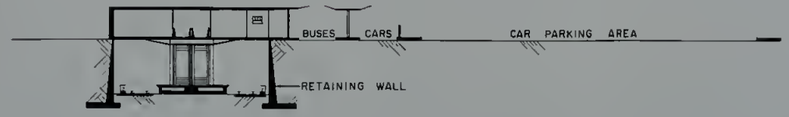


TRANSFER TERMINAL — DALY CITY

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



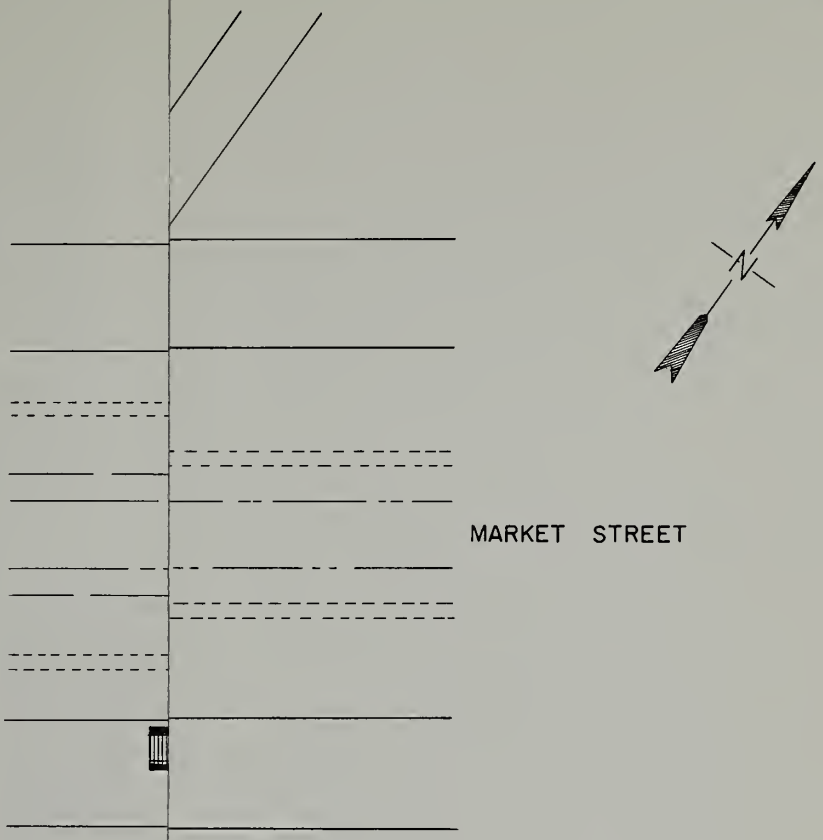
PLAN

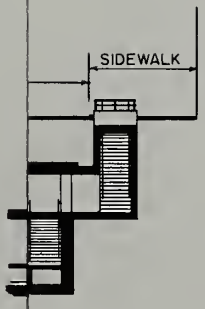


TRANSVERSE SECTION

TRANSFER TERMINAL — DALY CITY

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960

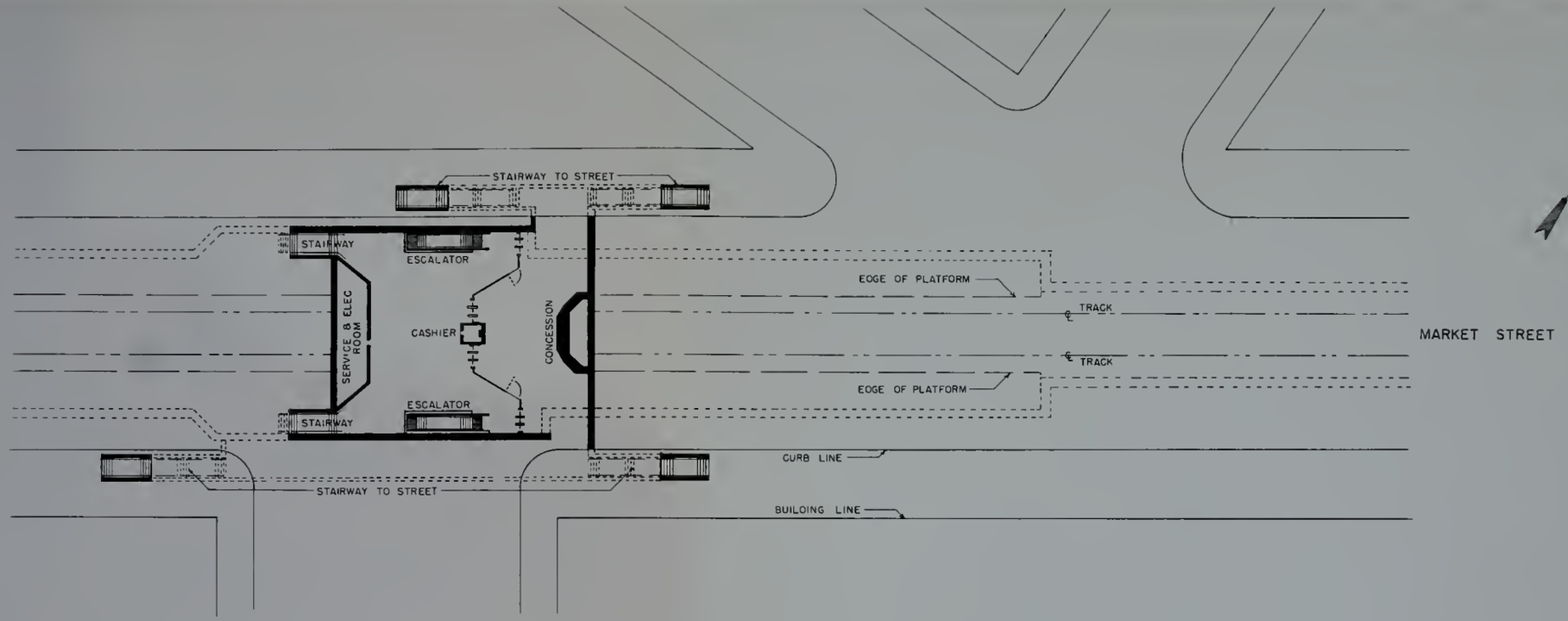




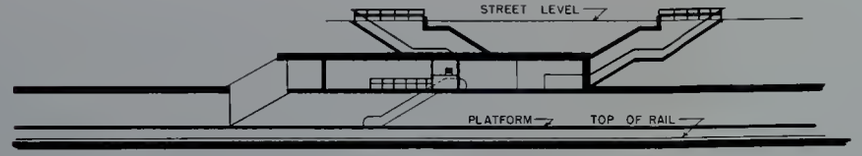
ON

TYPICAL SUBWAY STATION
MARKET STREET

CHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PLAN

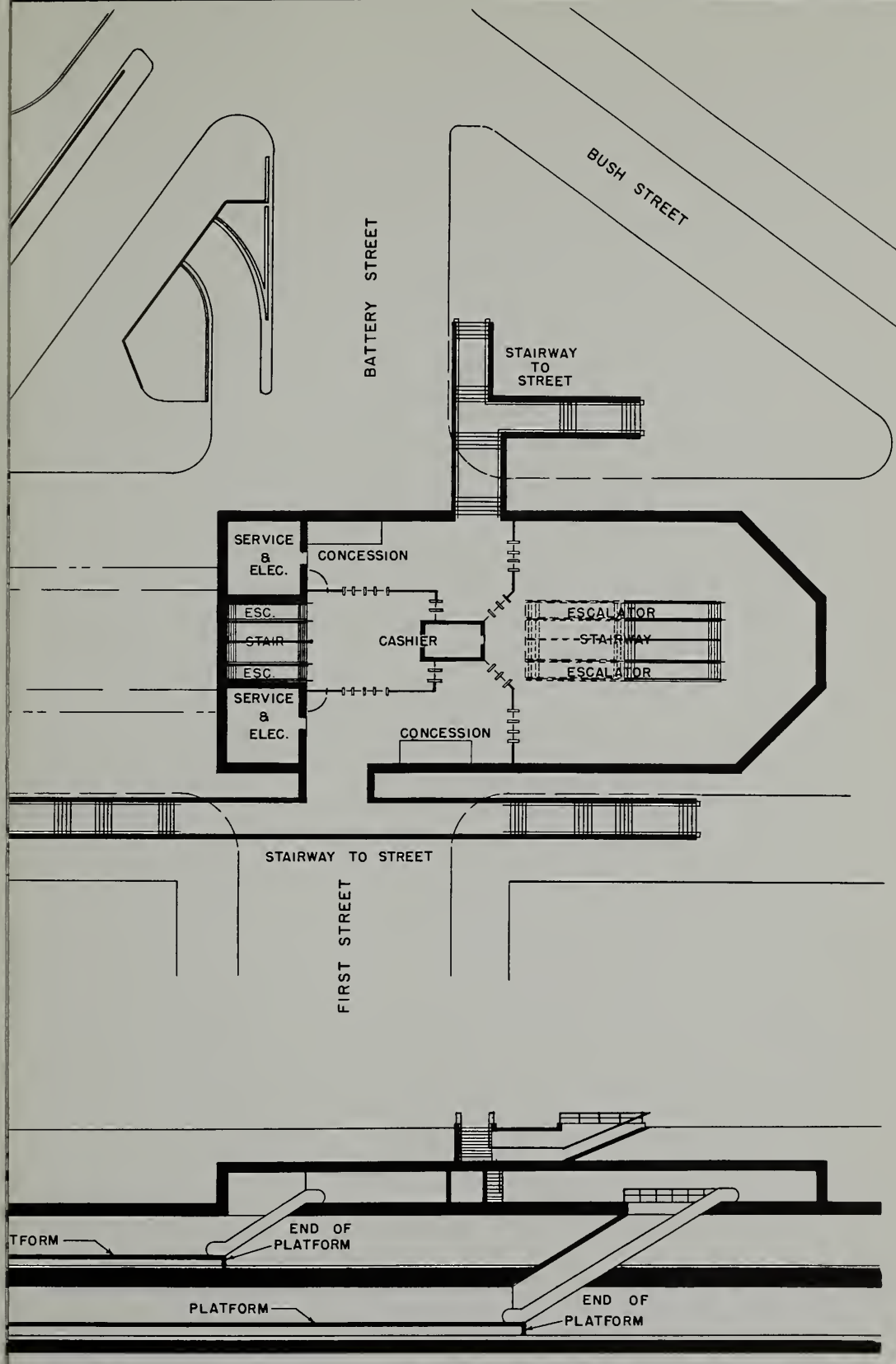


LONGITUDINAL SECTION

TRANSVERSE SECTION

TYPICAL SUBWAY STATION
MARKET STREET

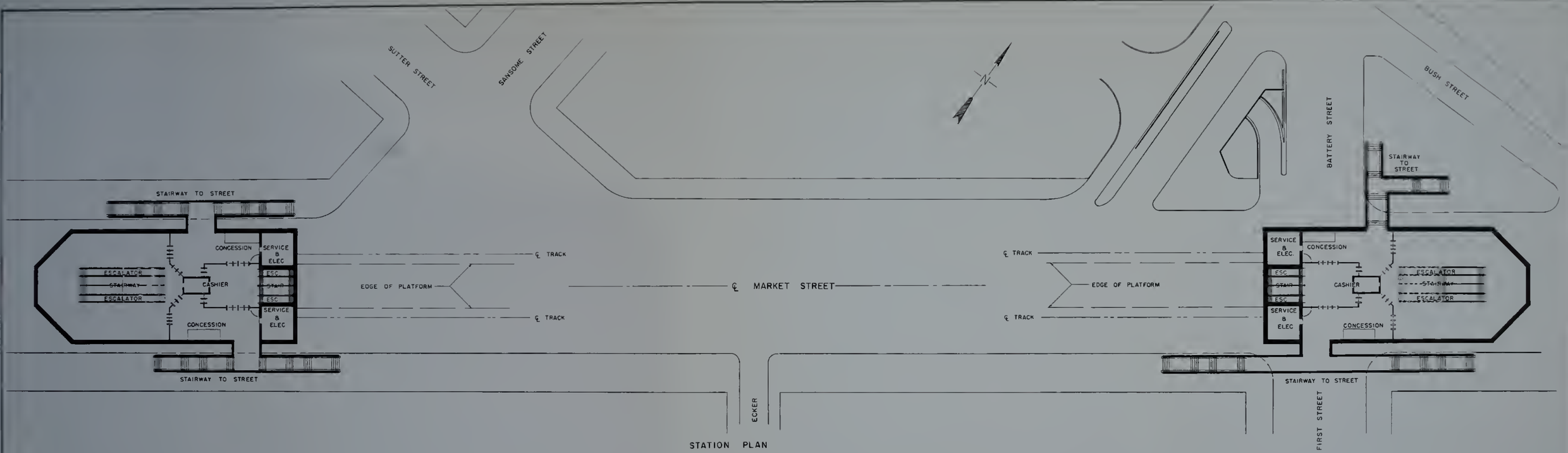
TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



SUBWAY STATION

MARKET STREET — FIRST STREET

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



STATION PLAN

LONGITUDINAL SECTION

SUBWAY STATION
MARKET STREET — FIRST STREET

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960